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Vickers, Principal K. H., M.A., University College, Southampton.

* Elected since September 1929.

† Resigned or Deceased.

‡ Have held the office of President.

RULES.

Name

1. The Name of the Society is the Entomological Society of the South of England and the headquarters shall be at Southampton.

Object

2. The Society is a Scientific Society instituted for the improvement and diffusion of Entomological Science exclusively. In particular its object shall be the study of the Entomological Fauna of the South of England.

Constitution

3. The Society shall consist of honorary special life and ordinary members.

Management

4. The affairs of the Society shall be conducted by a Council consisting of the Officers of the Society and seven members to be chosen annually. Four members of the Council shall form a quorum.

The Council shall have power to appoint Committees to assist them in the discharge of particular duties. Such Committees may include members not serving on the Council and shall exercise such powers and discretions as the Council may direct.

Officers

5. The Officers of the Society shall consist of a President Vice Presidents a Corresponding Secretary an Editorial Secretary and a Treasurer.

Trustees

6. There shall be four trustees who shall be members of the Society.

The Trustees are not officers of the Society.

A Trustee is notwithstanding his Trusteeship eligible for any Office. The property of the Society shall be vested in the four Trustees who shall hold the same upon the trusts of a declaration of trust in a form settled by the legal adviser of the Society in order to effectuate as near as may be the purpose and intention of these By Laws. The Declaration of Trust shall contain a power to add to annul or vary any of the trusts and may contain a power of attorney enabling any two trustees to execute on behalf

of any other trustee or trustees a document whereby a retiring trustee may be removed from his Office and a new Trustee appointed in his stead. A variation of the trusts may only be made pursuant to a special resolution setting out the terms of the variation to be passed as a special resolution as hereinafter provided.

Officials.

7. The Council shall have power to appoint and/or pay permanent officials.

Removal or Resignation of Officers

8. The Council may after giving any Officer or member of the Council the opportunity of being heard in his defence if he shall desire to be heard suspend any such Officer or member of the Council from the exercise of his office or remove him and declare his office vacant and the Council may appoint any member of the Society to fill the office until the next annual meeting.

The President

9. The President shall preside at all meetings of the Society and its Council and regulate all discussions and proceedings thereat and carry into effect or cause to be carried into effect these By Laws.

In the absence of the President one of the Vice Presidents shall preside and if no one of these shall be present one of the members present shall be chosen to preside. The person presiding at any meeting shall have a second or casting vote in case of equality of votes.

Treasurer

10. The duties of the Treasurer shall be to demand and receive for the use of the Society all sums of money due and payable to the Society and to place the same to a separate account in some Bank to be directed by the Council. The Treasurer shall make all such disbursements as may be necessary by cheque, such cheques bearing the signature of the Treasurer and counter signature of one of the Secretaries. No payment shall be made by the Treasurer exceeding in amount £5 without the sanction of the Council. Once at least in every year the Treasurer shall prepare a Profit and Loss account and a Balance sheet for submission to the Auditors. Such Profit and Loss account and balance sheet shall be made up to the 31st December in every year.

Auditors

11. The Society shall elect at its Annual Meeting two of the members to audit the Society's accounts and the Treasurer shall produce to the Auditors sufficient vouchers of his receipts and payments.

Corresponding Secretary

12. The Corresponding Secretary shall be responsible for the proper conduct of all correspondence on behalf of the Society.

Editorial Secretary

13. The Council shall select a member of the Society to be called the Editorial Secretary. He shall act as editor of its proceedings and transactions and shall at the end of the year submit to the Council a list of the communications and papers made and read during that year. He shall take the Minutes of all meetings of the Society and its Council and enter them into Minute Books. In the absence of the Editorial Secretary from any meeting the Chairman of such meeting shall appoint a member to perform the duties of the Editorial Secretary with regard to minutes.

Librarian

14. The Council shall appoint a member to act as Librarian for the current year. The Librarian shall be responsible for the issue of books to members the return of books by members for care and custody of the Library and for compiling and keeping up to date the catalogue.

Library Regulations

15. Books in the Library may be borrowed by members for such time and in such manner and on such terms as the Conncil may from time to time resolve. The title of every book issued shall be entered in a Library Loan Book by the Librarian. No book may be taken abroad by a member or sent to any place outside the British Isles except by permission of the Council. All books the property of the Society shall be returned to the Library on such a day as shall be fixed by the Council for the purpose of checking the catalogue thereof. Any book or other property lost or damaged by any member shall forthwith be replaced by that member or such sum shall be paid by such member as compensation to the Society as the Council may fix. Except with the permission of the Council no books shall be retained by a member for a longer period than three months nor shall any member have more than four volumes or papers at a time.

Election of Officers and Council

16. (*a*) The Council and Officers shall be elected at the Annual General Meeting of which Meeting at least 30 days notice shall be given. The Council shall with the notice of meeting circulate a list of recommendations of members to fill the offices of the Society other than the Council and such recommendations shall be accepted by the members unless 14 days prior to the date of the meeting

(*b*) At ordinary meetings unless otherwise determined by the Chairman the Order of business shall be as follows :—

(i.) The Minutes of the last Meeting shall be read and confirmed ;

(ii.) Donations made since the last meeting shall be announced;

(iii.) Election of Candidates for admission ;

(iv.) Exhibition of specimens which shall be accompanied by a note in writing descriptive of the same and discussions thereon.

(v.) Entomological communications shall be announced and/or read ;

(vi.) Business not specified in the above order and discussions shall be taken at such time and in such manner as the Chairman shall direct.

Communications and Papers

25. Any member desiring to make a communication or read a paper shall inform the Corresponding Secretary in writing giving the title and a short sketch of the scope or contents. The Council shall direct whether the communication or paper shall be made or read and when. Any note intended to be read by a member at any meeting the reading of which may occupy more than 5 minutes shall be deemed to be a communication. The Chairman of any meeting may in special circumstances permit the reading of a communication of which no notice has been given.

Special Meetings

26. The Council or three or more members by written notice to the President and the Corresponding Secretary may require a special meeting to be held. A notice thereof shall be sent to every member having an address in Great Britain. Any motion to be submitted at such meeting shall be set out at length in the notice and shall be if passed a special resolution. These By Laws may only be altered by a special resolution and a variation of the trusts upon which the Society's property is held shall be made only by special resolution. At a Special meeting 15 members shall form a quorum.

Annual Meetings

27. Annual meetings of the Society shall be held in the month of January in every year. The notice of such meeting shall be accompanied by a short financial statement. At this meeting there shall be read a report previously approved by the Council of the conduct of the Society during the preceding year and the report of the Treasurer and if requisite of the Auditors.

Transactions and Journal of Proceedings

28. The Council may annually direct the publication as transactions of the Society of papers read by members or communicated

by members which shall in the opinion of the Council form a useful contribution to entomological science. The Council may at their discretion publish as well a journal of proceedings but shall in any event publish a duly audited financial statement. The author of any published paper shall be entitled to receive 25 copies thereof gratis.

Registration

29. The members in General Meeting may direct the registration of the Society as a Company with liability limited by shares or by guarantee and may authorise an application to the Board of Trade for permission to register without the word limited. The Society whether registered or not registered shall not at any time make any division gift dividend or bonus in money to or between any of its members.

Note.—In the interpretation of these By Laws the masculine gender imports also the feminine gender and the singular number imports the plural number unless the context otherwise requires.

FINANCIAL STATEMENT FOR 1930.

To 31st December, 1930.

Receipts.

	£	s.	d.
Balance from 1929	50	4	11
Subscriptions	60	7	6
Sale of Publications	12	3	11
Donations to Publication Fund	9	15	6
Total	132	11	10

Expenditure.

	£	s.	d.
Rent	6	17	6
Printing Transactions	60	19	6
Reprints (Hemiptera of Hants)	8	8	0
Hon Sec.'s expenses	11	16	3
Hon. Editor's expenses		11	8
Sundries	3	15	0
Balance	40	3	11
	132	11	10

THE BRITISH SPECIES OF ASILIDAE (DIPTERA) AND THEIR PREY.

By B. M. Hobby, B.A., F.E.S.

This paper is presented as part of an investigation undertaken to explore more fully the field of research opened up by Professor E. B. Poulton in his paper on "Predaceous Insects and their Prey." It also attempts to collect together such observations on the predaceous habits of the British species of Asilids as have appeared from time to time in the English and Continental journals. Although 130 new and hitherto unpublished records are here brought forward, a large number of the remainder are due to the important works of E. B. Poulton (1906), D. Melin (1923), F. G. S. Whitfield (1925) and E. Séguy (1927). In the present paper full data are given wherever possible, but a statistical treatment has not been attempted because so many of the published records state that an insect is preyed upon, without giving any indication of the number of observations made or of specimens taken. In connection with this point the following quotation from Professor Poulton's paper may well be given. "It is not sufficient to know that an insect is predaceous and that it is believed in a general way to attack particular species or groups of species. We need precise records and the careful preservation of material for critical examination in the future."

The Asilidae are predaceous throughout their adult life, and do not take any food except living insects. It has often been stated that they kill their prey instantaneously; Whitfield (1925) has shown that *Machimus* and *Asilus* possess thoracic and labial glands opening into the proboscis, and concludes that the former are adapted to poison the prey, while the latter secrete a fluid which dissolves its tissues.

The nature of the prey caught by predatory insects is limited by many interacting and overlapping factors of which the four following are apparently of prime importance:—1. The ecological association in which the insect lives; 2. The method of hunting; 3. Morphology (*e.g.*, structure of compound eyes, wings, legs and mouth-parts); 4. Preferential Selection.

A brief account of these factors based upon the work of Melin, supplemented by that of Lundbeck (1908), Poulton (1906), Séguy (1927) and Verrall (1909) is given in the general account of each species. Observations not otherwise acknowledged are from Melin and Verrall.

The work has been carried on at Oxford in the Hope Department of the University Museum, under the direction of Professor E. B. Poulton, without whose constant help and invaluable criticism it could never have been undertaken. In addition to material contained in the Hope Department, specimens have also been received from Messrs. E. R. Goffe, F. J. Killington, O. W. Richards and J. W. Saunt. Much kind help in identification was given by Miss D. Aubertin, Messrs. R. Benson, W. E. China, J. E. Collin, F. W. Edwards, A. H. Hamm, F. Laing, O. W. Richards, H. Scott and C. J. Wainwright. To these entomologists I desire to express my sincere thanks.

Leptogastrinae.

Unlike most Asilids the species of this subfamily hunt on the wing, mainly attacking insects which rest among tall grasses. In flight the abdomen is held "parallel to the ground, and the long hind legs 'drag' more or less vertically. The front pair of legs . . . . are kept tightly pressed under the proboscis and . . . form the real means of capture." (M).

Leptogaster cylindrica, De G.

This species is found from June until August, and frequents tall grass in sandy localities, both in woods and open spaces. Its sight appears to be poor since it often attacks more or less insect-like objects. The mouth-parts scarcely exceed 1mm. in length and are weaker than in any other British species, while the legs bear but a scanty covering of bristles and hairs—morphological features probably associated with the capture of resting insects. The recorded prey consists of Homoptera, small soft-bodied Diptera, a spider, and a little parasitic Hymenopteron. The latter was evidently too heavily chitinised to be pierced by the Asilid's weak hypopharynx and eventually flew away unhurt. The record of spider prey, the only one recorded in this paper, is of very great interest, as Dr. Neave's unpublished observations on Ethiopian species of this subfamily indicate that spiders are frequently captured.

Leptogaster guttiventris, Zett.

Morphologically this species is very similar to *cylindrica*, which it also resembles in habits and time of flight. It has probably been overlooked for these reasons, and not because it is rare. Melin alone records prey—small Homoptera resting on the grass.

Dasypogoninae.

The species belonging to this subfamily have rather stronger mouth-parts than the Leptogastrinae. Usually they sit about on various objects and make "capture-darts" at passing insects, but *Dioctria* may sometimes hunt after the manner of *Leptogaster*. In *Dioctria* the legs are but scantily covered with hairs and bristles, but the latter are well developed in *Lasiopogon* and *Isopogon*.

Isopogon brevirostris, Mg.

The time of flight is from May to July, when it frequents grassy places in mountainous districts. The proboscis is over 1mm. in length, and the legs are provided with a dense covering of hairs and bristles. Only two species of prey are recorded—both Braconids with a fairly resistant cuticle. Many more observations are needed before general conclusions as to the nature of the prey can be reached. Possibly future work may show that this species, like *Dioctria*, persistently captures Hymenoptera.

Lasiopogon cinctus, F.

Associated with dry and sandy localities, this local species may be found in May and June sitting on tree-trunks, fences, stones and the ground itself. Morphologically it is equipped for the capture of larger and harder prey than is *Leptogaster*. Thus the proboscis, although scarcely exceeding 1mm. in length has a stronger hypopharynx, while the long legs are thickly covered with long bristles and hairs. Melin records that "capture-darts" of some decimetres are made, so that its sight is good. The recorded prey consists of Homoptera and Diptera. Some of these are quite small, but *Dialineura* and *Pachyrrhina* are tolerably large insects. Of the latter species three examples were seen to be captured at about the same time in the same locality. They were probably flying in considerable numbers, and would have been easy to catch.

Dioctria.

The tables for the six British species of this genus show a remarkable preponderance of Hymenoptera, and especially of Ichneumonidae. Furthermore, since there are only four instances of this family recorded among the prey of other genera, the conclusion of Marshall and Poulton that the *Dioctria* are the chief Asilid foes of the Ichneumonidae is confirmed by more recent evidence. It is of great interest to note that the species of *Dioctria* enter into mimetic association with the group which they especially attack. This mimetic resemblance to prey is only of a general nature in *Dioctria*, but in the Ethiopian and Oriental genus *Hyperechia* it is very close indeed. Although among all the British Asilids the *Dioctria* afford

the most striking instances of specialised attack on one group of insects, yet even here the instinct is far more imperfect than it is in, for example, the Crabronid wasps; for examples of various Orders are often taken as prey by these flies.

The species of *Dioctria* have a much better developed proboscis than any of the genera hitherto considered. The hypopharynx is strong, and turned upwards at the apex. This type occurs also in *Pamponerus*, a species which frequently captures Hymenoptera and Coleoptera. Melin suggests that it may be specially adapted for the piercing of hard chitin. The legs have but a scanty covering of hair, so that small insects would appear to be difficult to retain. Among the recorded prey, however, a few small species are included.

Dioctria atricapilla, Mg.

This southern species occurs in meadows in June and July. It usually rests on grass or low leaves, and hunts by means of "capture-darts." Ocasionally, however, it may hunt on the wing as does *Leptogaster*, and this habit is common to other species of *Dioctria*. The recorded prey includes more Diptera than Hymenoptera, but there is only a single instance of prey outside these two Orders. The time of flight coincides with that of certain species of *Bibio*, which may occur in considerable numbers, and would be especially easy to catch. Three examples of *Bibio pomonae*, F. are recorded in the tables. All the captured Hymenoptera are Parasitica.

Dioctria oelandica, L.

Like *atricapilla*, this, the largest British species of the genus, is a southern insect, but occurs a little earlier and is associated with woods rather than open fields. It usually rests high up on the leaves of young trees. The prey—as a rule fairly large insects—chiefly consists of Hymenoptera, among which the Ichneumonidae predominate. Four sawflies are also recorded, and perhaps are more often taken than would appear from the list. The single instance of a Panorpid is of interest, as the Mecoptera superficially resemble Hymenoptera. The Dipterous prey include another species of *Dioctria*, itself very Ichneumon-like. A Tineid moth is the only instance of Lepidopterous prey recorded for the whole genus.

Dioctria cothurnata, Mg. = reinhardi, Mg.

Verrall considered this insect to be more common in Scotland than in England, and records that Col. Yerbury once found it in some numbers in a cornfield in Inverness-shire. The single instance of Ichneumonid prey here recorded is from the New Forest.

Dioctria rufipes, De G.

The records for *rufipes* are more complete than for any other British species of Dasypogoninae. It occurs from May to July in meadows, and hunts from both low and high points of vantage. Occasionally it may adopt the hunting methods of *Leptogaster*. Hymenoptera, especially Ichneumons, largely predominate, but Diptera also form a considerable proportion of the prey. The occurrence of three sawflies and a single Aculeate is of much interest. In addition to these two Orders there is one Hemipteron. The insects captured are on the whole fairly large.

Dioctria baumhaueri, Mg.

Mainly a southern insect, occurring from June to August. The prey consists entirely of Hymenoptera and Diptera, of which the former predominate. Only four of the ten Hymenoptera are Ichneumonids. Three Aculeates are tabulated, but fuller data are required in order to form a safe estimate of their relative importance. Some of the prey are quite small.

Dioctria linearis, Mg.

This species would appear to be somewhat local and to occur in June and July. There are unfortunately no British records of prey, and Séguy's list in the *Faune de France* contains only Diptera—a remarkable result when considered in relation to the habits of the other members of the genus. Nevertheless, since *linearis* is the smallest British species, it is perhaps ill-adapted for the capture of Hymenopterous prey. Critical observations are needed before it can be established as a species with aberrant habits.

Laphrinae.

The members of this subfamily have a very strong and long proboscis (about 4mm. in length in the case of *flava*), well developed legs with thick femora and dense covering of hair. Melin points out that the bristles are less well developed than the hair, and that structurally *Laphria* is adapted for the capture of both large and small insects. We have only two species, of which *Laphria flava* is one of our most powerful Asilids.

Laphria flava, L.

A Scottish species not found in England. It occurs from June to September in sunny forest clearings, especially in pine woods. Melin found that the favourite perch was the top of a tree-stump. Less commonly it hunted from tree-trunks and fences. Its power of vision was good, and " capture-darts " of 5-6 metres were made, the prey being usually caught from behind. The flight, heavy and

buzzing, reminded him of a bumble bee. The legs, hanging down, formed a net-like apparatus for seizing prey, comparable with that of dragon-flies.

The prey consists of fairly large insects, among which Diptera and Coleoptera predominate. Both Melin and Jordan have observed that *Coccinella* was taken in large numbers on particular occasions, indicating that the abundance of certain species in the local fauna may have an important influence upon the selection of prey. Although Dipterous victims are more frequently recorded than others, it is possible that special attacks are also made on beetles; but extended observations are necessary. The prey also includes a Pentatomid and Homoptera. In 1906 only one instance of prey—an ant—was known, and since then only two other species of Hymenoptera and one Mecopteron have been added. Thus although *Laphria flava* is a mimic of *Bombus*, we can no longer accept the view that Hymenoptera are especially attacked, and this Asilid should be removed from Group II. and placed with *Laphria gibbosa* in Group I. of Poulton's tabulation of mimetic Asilids (1906, p. 378).

Laphria marginata, L.

A woodland species occurring (June-July) in the Southern half of England, where it hunts from leaves of trees, tree trunks, stumps and stones. It is about half the size of *flava*, and more nimble on the wing. There are few records of prey, and these are distributed among four orders much as in the last species.

Asilinae.

The eleven British species of this sub-family represent nine different genera. The majority of the species have a well-developed covering of hairs, bristles and spines; the proboscis varies in length from 1-3mm. The smallest and weakest species is *Epitriptus*, the largest and strongest *Pamponerus* and *Asilus*. They generally frequent dry districts, particularly those of a sandy nature, and hunt their prey by "capture-darts" either from an elevated perch or less often from the ground itself. The abdomen of a resting Asiline often falls over so that the attitude is lop-sided (*vide* Melin, 1923, Fig. 11, p. 9). In flight the legs form a "capture net" as in *Laphria*.

Philonicus albiceps, Mg.

Essentially a coastal species which hunts over sand dunes from June to September, but is occasionally found inland haunting sandy localities. This Asilid rests on the sand and is very shy, its vision being apparently acute. Thus, Melin records that a female was attracted by a beetle (*Anomala*), which flew up at a distance of

40cms. The legs are long and bear long bristles. The mouth-parts are about 1·5mm. long and fairly well developed, although not strong for a species of this size. Large insects with a hard integument are to be found among the prey, nearly all of which are Diptera. The influence of the local fauna in determining the prey of *albiceps* is seen in the number of coastal insects appearing in the list. F. Smith's (1870) observation is unique as a record of Acridian prey taken by any British Asilid, other than *Asilus crabroniformis*; this is doubtless due to the relatively small size of the species.

Asilus crabroniformis, L.

This species occurs from July to September in dry districts, especially heaths and chalk downs. Although a general mimic of hornet-like Aculeates, it is probable that during prolonged rest protection is attained by cryptic resemblance to a dead leaf. This suggestion is due to Poulton (1906, p. 374), who observed that, the remarkable inverted attitude taken up by a female *crabroniformis* in going to rest for the night, was beautifully adapted to conceal the contrasting colour pattern of the dorsal surface of the abdomen, and to display the cryptic brown shades of the ventral surface. It hunts from the ground or low-lying objects, sticks, dung, etc. The power of vision is good, and "capture-darts" are made at a distance of a few decimetres. Melin records that a female saw and seized a grasshopper that was creeping along a grass-stem about 50cms. away. The mouth-parts are very strong, exceeding 3mm. in length, and having a heavy chitinised labium. The bristles on the legs are unusually strong, but their weakly-developed hairy covering has led Melin to suggest that *crabroniformis* is not well adapted for the capture of small insects—a conclusion supported by the observations recorded in this paper. More than half the insects captured are large Diptera; the 5 Hymenoptera are formidable Aculeates; the Coleoptera include large, heavy, well armoured beetles such as *Necrophorus* and *Aphodius rufipes*; the Orthoptera are all of them Acridiidae. There are in addition two instances of Lepidoptera, the Lycaenid being of especial interest, in as much as the British Asilidae rarely capture butterflies. F. Smith's record of "small diptera" probably refers to Anthomyids such as *Musca autumnalis*, which would be about the size of the smallest fly that *crabroniformis* is likely to capture.

Rhadiurgus variabilis, Zett.

A Scottish insect found from June to July frequenting sandy localities in clearings among heather and pines. It generally sits on the ground, but also hunts from herbage, stones and fences. Vision is good, and "capture-darts" from about 20cms. are made.

The proboscis is little more than 1mm. in length, and is rather stronger than that of *Epitriptus*. Melin records the only known prey, and these are distributed between four different orders. They include the only Hemerobiid and the only Blattid known to have been taken by any British species of Asilidae.

Pamponerus germanicus, L.

This is a rare species best known from the Barmouth and Porthcawl localities, where it occurs on the sandhills in June and July. On the Continent it frequents similar localities, clear spaces, fields, etc., often in or near woods. The proboscis is nearly 2mm. in length, with a strong upturned apex as in *Dioctria*. The legs, like those of *crabroniformis*, have strong short bristles, but the hairy covering is weak. Hence Melin considered it best adapted for the capture of large coarse prey—a view supported by the recorded examples, which almost entirely consist of Coleoptera and Hymenoptera. Prey nearly restricted to these two Orders is unique among British Asilids, and some specialisation in the attacks of this species is to be suspected, but further records are urgently required.

Dysmachus trigonus, Mg.

Verrall states that this is a common and widely distributed insect found on "scrubby" ground, on sandy sea-coasts, and also on similar surfaces inland. The time of flight is from May to August. The proboscis is almost 1·5mm. in length, and the legs are well provided with hairs and bristles. The captured insects may be quite large (*Philonicus*), both large and hard (*Onthophagus*), or small (*Sciara*), but on the whole are of medium size. They include 2 Lepidoptera, 2 Hymenoptera, a single Coleopteron and at least 14 Diptera.

Eutolmus rufibarbis, Mg.

A rare British insect. Melin records it from meadows and arable land in Sweden, while Verrall's localities are nearly all in wooded areas. H. W. Andrews has also found it on sandy ground in a Kentish wood. It usually hunts from an elevated resting position and makes "capture-darts" of 75cms. The mouth-parts are about 1·6mm. long, and rather stronger than those of *Dysmachus*. The legs are well provided with bristles and hairs. The short list of recorded prey includes six species of Diptera, an ant and a Geometrid moth—all insects with a fairly resistant integument.

Machimus atricapillus, Fln.

This species is one of the commonest British Asilids, occurring from June to September in meadows and clearings with low bushes.

It is quite common on the chalk downs near Winchester, where it hunts from the bare ground, stones, low herbage and the trunks of small trees. It repeatedly makes "capture-darts" of some 30-40 cms., but relatively few of these are successful. A male observed in this locality by the writer, made several fruitless 'capture-darts,' and then suddenly sprang for a distance of about 30 cms. upon an insect, up to that moment unnoticed, which was then seen to be a female *atricapillus*, lying on her back with the male standing over her so that the two ventral surfaces were in apposition. Copulation took place, and the male swung round to the dorsal surface of the female and grasped her thorax, adopting the position described and figured by Melin (1923, fig. 248, p. 214).

The mouth-parts are a little over 1mm. in length, stronger than those of *Epitriptus*, but not as strong as in *Philonicus*. The legs have fairly well-developed hairs and bristles. The record of prey is more complete than for any other British Asilid, and shows that *M. atricapillus*, primarily an enemy of Diptera, is not well adapted to prey upon insects with a hard integument. Some of the captured Diptera are fairly tough, but not so hard as the Hymenoptera and Coleoptera. Of the latter the *Sitones* was pierced between the elytra by the Asilid's proboscis. The arrangement of hairs on the legs makes it possible for the Asilid to catch quite small insects such as Aphids and Mycetophilids, but the captured insects are usually of medium size and texture.

Machimus rusticus, Mg.

A very rare insect of which but few examples exist in collections. Structurally it is very similar to *atricapillus*, and like this species occurs on downs in August. The single British record of prey was made in 1930 by Col. F. A. Labouchere, the victim being the butterfly *Lycaena corydon*, L. Only one other instance is known, a continental example with a Dascillid beetle.

Epitriptus cingulatus, F.

This species, the smallest of the British Asilines, is fairly common from July to September. In a sandy locality at Longdown, in the New Forest, it was found among heather and bracken from which it hunted; also on the bare surface of the ground, along a dusty roadside, and on dung. "Capture-darts" of about 20cms. were made, and once a *Calliphora* at this distance was seen to be caught. *E. cingulatus* is structurally less well equipped than any other British Asiline for the capture of prey. The mouth-parts are barely 1mm. in length, and the hypopharynx and maxilla are weak. The small legs also form a feeble apparatus for capturing insects. The evidence suggests that this Asilid generally attacks small insects such as Anthomyids and the smaller Homoptera, and that the two examples of *Calliphora erythrocephala* are exceptional.

Neoitamus cyanurus, Lw.

Essentially a woodland Asilid for which the dates here tabulated range from May 30th-August 12th, although Verrall appears to be right in considering it mainly a June species. It frequently takes up an elevated position on the leaves or bare branches of trees, sometimes at a height of four metres from the ground. On other occasions, however, it may hunt from low herbage, tree trunks, stones or the ground itself. The vision is good, and Melin records that a small fly was attacked at a distance of 50cms. The mouth-parts are similar to those of *Philonicus*, being of the same length, but a little stronger. The prey consists chiefly of Diptera, Lepidoptera and Coleoptera, but single examples of the Orders Odonata, Hemiptera, Neuroptera and Hymenoptera are also recorded. The relatively large number of Lepidoptera is of much interest, and strongly suggests the existence of specialised attack, perhaps associated with the habit of hunting from an elevated position on trees.

Thus Verrall records (1909, p. 683), "*N. cyanurus* is sometimes abundant in woods, and I remember seeing it in considerable numbers in Darenth Wood in Kent on June 18, 1868, when specimens were sitting motionless on the ends of leafless twigs until *Tortrix viridana* flew past, when they would swoop down from their coign of vantage and bring their prey back to the twigs for consumption; they how-ever did not hesitate to pounce upon fair-sized *Geometrae*." Dragonflies are frequently taken by tropical Asilids, but the *Agrion* recorded by Melin is the only example known to be captured by a British species. The Chrysopid is only the second example of Neuropterous prey, and indeed the first of its family. The rarity of these captures is doubtless to be explained by the fact that the Neuroptera generally keep under cover during the daytime. The five beetles prove that *cyanurus* is able to deal with insects having a hard integument, but none of them is as strongly chitinised as the prey of *Pamponerus*. Séguy records as prey a Mycetophilid and a Chironomid, but small and delicate insects are not often taken by this Asilid.

Neoitamus cothurnatus, Mg.

N. cothurnatus is but little known as a British insect, and is the only species for which no prey has as yet been recorded. Up to the present time it has only been taken in the woods around Oxford in June. Its habits may be similar to those of *cyanurus*, to which it bears a close morphological resemblance.

The Relative Frequency of attack by Male and Female Asilids.

Attention was directed to this point by Poulton (1906) who found that for 226 instances of Asilids and prey collected in many parts of the world the sexes of the captors were as follows :—

Females—160; Males—47; Undetermined—19. Thus the females were between three and four times as numerous as males. The present paper includes all the British examples recorded in his paper together with many others, yielding in all:—Females—176; Males—81; Undetermined—over 221, but no trustworthy estimate can be given. Thus the female captors among the British species, although twice as numerous as the males, are far less preponderant than in the world list. This difference between the predatory habits of the sexes has doubtless been brought about by the necessity for ripening the ova.

Analysis of the Prey.

The Diptera are the chief victims of the British Asilids. Within the Order, selection is very wide, for no less than 31 families are represented. As might have been expected, the ubiquitous Anthomyids and Tachinids are the most frequent victims followed by the flower-frequenting Syrphids and weak-flying Tipulids; after these the Empids, Asilids and Cordylurids, but there are relatively few examples of other families. The range in size is very great, including small and fragile insects like Chironomids with large and powerful ones such as Asilids and Tabanids.

Next in importance, largely owing to the specialised attacks of *Dioctria* upon the Parasitica and sawflies, come the Hymenoptera. The few records of ants, as in the examples studied by Poulton, "were probably all winged when captured, and the numbers must here be considered in relation to the limited period when the prey possesses the power of flight." The Aculeates are not well represented, and with the exception of the five examples taken by *crabroniformis*, are the smaller and less formidable species. This is a very different result from that obtained in the study of the African and American species, and may safely be correlated with the small size of the British Asilids.

The Coleoptera are represented by twelve different families, the Scarabaeidae predominating. Because of the frequency with which they take to flight in their search for dung, these are the beetles that would most often be met with by Asilids. The remainder also are forms commonly seen on the wing or on flowers by day.

The Lepidoptera mainly consist of 'micros,' and Geometridae. Butterflies are very poorly represented (3 records), a result very different from that obtained by Poulton for the Asilids of the world.

The importance of the Hemiptera as Asilid prey cannot well be estimated in the present state of our knowledge, but the Jassidae and Aphidae are evidently freely taken by certain species.

Orthoptera are only important as the prey of our largest species *Asilus crabroniformis*, which accounts for nearly all the records.

With the exception of the Blattid taken by *Rhadiurgus* all are Acridiidae, a predominance obviously due to their habits.

The remaining Orders are of little importance, including only one or two instances of Odonata, Neuroptera, Mecoptera and Trichoptera. There is in addition a single record of spider prey, but it seems probable that future observation will show that these Arachnids are often taken by the Leptogastrinae.

Asilidae as the Enemies of Specially Protected Groups.

The British fauna is scarcely a suitable one for the investigation of this problem. With the possible exception of the Syrphidae, most of which enter into a mimetic association with the Hymenoptera, the majority of the prey are Diptera not specially defended against the attacks of vertebrate enemies. Again, among the Hymenoptera only a small proportion consist of stinging Aculeates, although all are more or less protected by their tough integument, and probably by secretions. The list of Coleoptera includes more specially protected than unprotected insects—the Meloidae, Silphidae, Oedemeridae, Coccinellidae, Staphylinidae and Aphodiinae in particular having distasteful qualities. The Lepidoptera are without special protection, but among the Hemiptera, the Pentatomidae, Reduviidae and Cimicidae are notorious in this respect. Among the Orders less well represented the Blattidae and Chrysopidae possess distasteful qualities, but only single instances in these two families are recorded.

Asilidae as the Enemies of Predatory and Parasitic Insects.

The records of prey include many predatory and parasitic species together with some which are predatory only in the larval stage. As Poulton has pointed out, this "goes some little way to reduce the economic significance of *Asilidae* as destroyers of insects."

Courtship.

The observations of Poulton (1906, p. 366) on *Dasypogon* (*Selidopogon*) *diadema*, F., point to the conclusion that in certain Asilids courtship is fraught with grave danger to the male, and is therefore conducted with great caution. This view was supported by actual records of the female eating its own male, and suggested that females with prey might be especially sought by males. Melin, however, states that out of all the hundreds of pairings he has witnessed, only on one or two occasions (*Lasiopogon* and *Neoitamus cyanurus*) was the female with prey. The fact that a paired female is in possession of prey is of course important, but the prey if absent may have been dropped before the observation, so that

comparison between the two conditions is valueless. Careful observations of courtship, and especially the behaviour of the male towards females with and without prey are much to be desired. In addition to the observations of Melin the present paper records four instances in which a paired female was with prey (2 *M. atricapillus*, *N. cyanurus* and *E. cingulatus*), and one in which a male *P. albiceps* attempted to pair with a female in possession of a *Calliphora*.

Asilids occasionally capture other Asilids, and even their own species, but few observations on this point have been made, and generalisation is therefore premature. There is no instance of a female being eaten by a male of its own species, nor do the records suggest any exceptional mortality of males due to the predaceous habits of the females. Jaennicke (1867, p. 93) reports finding in a collection a pair of *N. cyanurus* labelled : "Dass ♀ hat nach der Begattung das ♂ getödtet und saugt es aus," but it is more probable that the male was attacked on first approaching the female, and not after copulation. This view is consistent with the observations of Poulton on courtship and of Xambeu (1901, p. 38), who writes concerning *A. crabroniformis*, ". . . . souvent ce sont les mâles qui au moment du rapprochement des deux sexes, deviennent victimes de leur ardeur, ..."

Explanation of Tables.

The first five columns contain respectively, a serial number, sex of Asilid, prey, locality and date. The observer, source, and page reference (if previously published) are indicated respectively by three sets of figures used in the last column of tables, the publication being further distinguished by the use of Clarendon type. References to footnotes follow and are enclosed in brackets. Lists of publications and of observers are given on pages 41 & 42. The signs *, †, ||, imply respectively that the material is known to be preserved in the Hope Department, British Museum or other collections. A ‡ is placed in the last column when the published record states that a species is preyed upon without any indication of the number of observations made or of insects captured.

Signs used in Tables.

* Material known to be preserved in the Hope Department.
† ,, ,, ,, ,, ,, ,, ,, British Museum.
‖ ,, ,, ,, ,, ,, ,, some other collection.
‡ The published record states that the insect is preyed upon, without giving any indication of the number of observations made or of specimens taken.

Leptogaster cylindrica, De G.

Serial No. & Sex of Captor		Prey	Locality	Date	Reference
		HEMIPTERA.			
		Jassidae.			
1.	—	Various spp. [Cicadidae] indet.	Sweden	—	62 : 14 : 18 ‡
		Aphidae.			
2.	—	Various spp. indet.	,,	—	,,
		HYMENOPTERA.			
3.	♂	Small parasitic sp. indet.	,,	—	62 : 14 : 85—(1)
		DIPTERA.			
		Simuliidae.			
4.	—	*Simulium reptans*, L. [*erythrocephalum*, De G.]	France	—	71 : 22 : 18 ‡
		Chironomidae.			
5.	—	sp. indet.	Beckenham, Kent	11.vii.24	77 : 25 : 606
		Culicidae.			
6.	♀	*Culex pipiens*, L., ♀	,, ,,	19.vi.24	,,
7.	♀	,, ,, ♀	,, ,,	,,	,,
		Tipulidae.			
8.	—	Small sp. indet.	,, ,,	11.vii.24	,,
		Rhyphidae.			
9.	♂	*Rhyphus punctatus*, F., ♀	Streatley, Berks.	12.viii.24	,,
		Phoridae.			
10.	♂	*Phora*, sp.	Heston, Middlesex	15.vi.24.	,,
11.	—	Small flies, family indet.	Sweden	—	62 : 14 : 18 ‡
		Araneida.			
12.	—	A small spider.	,,	—	62 : 14 : 18—(2)

(1).—After several minutes the hymenopteron flew away unhurt.
(2).—Several attacks made. The spider attempted to keep on the opposite side of the grass stem ; but in the end the fly struck its prey.

Leptogaster guttiventris, Zett.

Serial No. & Sex of Captor		Prey	Locality	Date	Reference
		HEMIPTERA.			
1.	—	Small Homoptera.	Sweden	—	62 : **14** : 20 ‡

Isopogon brevirostris, Mg.

Serial No. & Sex of Captor		Prey	Locality	Date	Reference
		HYMENOPTERA			
		BRACONIDAE.			
1.	♀	* *Chaenon anceps*, Curt., ♀	Ferleiten, Salzburg, Austria	26.vi.30	67
2.	♀	* *Meteorus obfuscatus*, Nees., ♀	Barmouth, Wales	6.vii.02	80 : **16** : 337

Lasiopogon cinctus, F.

Serial No. & Sex of Captor		Prey	Locality	Date	Reference
		HEMIPTERA.			
		DELPHACIDAE.			
1.	—	*Liburnia*, sp.	Sweden	—	62 : **14** : 26 ‡–(3)
		DIPTERA.			
		CHIRONOMIDAE.			
2.	—	*Chironomus* [*Tendipes*] spp.	,,	—	62 : **14** : 26 ‡
		CECIDOMYIDAE.			
3.	—	sp. indet.	,,	—	,,
		TIPULIDAE.			
4.	♀	**Pachyrrhina histrio*, F., ♂	Porthcawl, S. Wales	11.v.03	80 : **16** : 338–(4)
5.	♀	* ,, ,, ♂	,, ,,	,,	80 : **16** : 338
6.	♀	† ,, ,, ♂	,, ,,	19.v.03	,,
7.	—	Small spp. indet.	Oxshott, Surrey	20.v.00	80 : **24** : 728 ‡
		THEREVIDAE.			
8.	—	*Dialineura* [*T.*] *anilis*, L.	Sweden	—	62 : **14** : 212 ‡–(5)
		EMPIDAE.			
9.	—	*Empis vernalis*, Mg.	,,	—	62 : **14** : 26 ‡

(3).—Other "Cicadae" also taken.

(4).—"The Asilid, still holding its prey, was being eaten by a spider, an immature *Lycosa*, sp.?"

(5).—On one occasion ♂ and ♀ Asilid *in cop.*, ♀ with *D. anilis*, L., as prey.

Serial No. & Sex of Captor		Prey	Locality	Date	Reference
		ANTHOMYIDAE.			
10.	—	*Hydrotaea* sp.	Sweden	—	62 : **14** : 26 ‡
11.	—	*Hydrophora conica*, Wied.	,,	—	,,
12.	—	*Chortophila* sp.	,,	—	,,
		PSILIDAE.			
13.	—	*Psila* sp.	,,	—	62 : **14** : 26 ‡–(6)
		SAPROMYZIDAE.			
14.	—	*Lonchaea* sp.	,,	—	,,
15.	—	Small spp. indet.	,,	—	68 : **14** : 26 ‡

Dioctria atricapilla, Mg.

		HEMIPTERA.			
		CAPSIDAE.			
1.	♀	*Capsus laniarius*, L.	Burnham Beeches, Bucks.	14.vi.24	77 : **25** : 607
		HYMENOPTERA.			
		ICHNEUMONIDAE.			
2.	♀	**Habrocryptus* sp. ♀	Matley Bog, New Forest	5.viii.07	47
3.	♀	*Lissonota sulphurifera*, Grav., ♀	Osterley, Middlesex	9.vii.24	77 : **25** : 607
4.	♀	†*Meloboris rufiventris*, Grav., ♂	Gravesend, Kent	4.vi.93	80 : **13** : 333
		BRACONIDAE.			
5.	♀	A small sp. indet.	Osterley, Middlesex	9.vii.24	77 : **25** : 607
		DIPTERA.			
		BIBIONIDAE.			
6.	♀	**Dilophus febrilis*, L., ♀	Oxford	9.vi.20	47
7.	♀	*Bibio pomonae*, F., ♀	Heston, Middlesex	4.vi.24	77 : **25** : 607
8.	♂	,, ,, ♀	,, ,,	2.vi.24	,,
9.	♂	,, ,, ♂	,, ,,	18.vi.24	,,
		EMPIDAE.			
10.	♂	*Empis pennipes*, L., ♂	,, ,,	6.vi.24	,,

(6).—Other undetermined Acalypterates taken.

Serial No. & Sex of Captor		Prey	Locality	Date	Reference
		TACHINIDAE.			
11.	♀	*Lucilia caesar*, L., ♂	Burnham Beeches, Bucks.	14.vi.24	77 : 25 : 607
		CORDYLURIDAE.			
12.	♂	*Scatophaga stercoraria*, L., ♀	Heston, Middlesex	20.vi.24	,,

Dioctria oelandica, L.

		MECOPTERA.			
		PANORPIDAE.			
1.	—	*Panorpa* sp.	Lodiswell, Devon	24.v.96	80 : 16 : 330
		LEPIDOPTERA.			
		TINEIDAE.			
2.	—	Probably *Adela* sp.	,, ,,	,,	,,
		HYMENOPTERA.			
		TENTHREDINIDAE.			
3.	♀	**Tenthredo ferruginea*, Schrank., ♂	New Forest	21.vi.05	30
4.	♀	**Tenthredopsis litterata*, Geof., ♂	Forest of Dean, Gloucestershire	13.vi.23	41
5.	♀	**Tenthredopsis litterata*, Geof., ♂	Farnham Wood, Dorset	8.vi.30	29
6.	♀	**Tenthredopsis coqueberti*, Kl., ♂	New Forest	21.v.05	30
		ICHNEUMONIDAE.			
7.	♀	**Cratichneumon annulator*, F., ♂	Pamber Forest, Hants.	30.v.03	41 : 16 : 330
8.	♀	†*Campoplex leptogaster*, Holmgr., ♀	Lyndhurst, New Forest	27.v.94	80 : 13 : 332
9.	—	* ,, sp. near *cultrator*, Grav., ♀	,, ,,	—.v.97	28
10.	♂	**Glypta resinana*, Htg., ♀	New Forest	21.vi.05	30
11.	♂	**Banchus volutatorius*, L., ♂	,, ,,	,,	30
12.	—	*Tryphon brunniventris*, Grav.	Sweden	—	62 : 14 : 24 ‡
		BRACONIDAE.			
13.	—	"Probably a Braconid."	Lodiswell, Devon	25.v.96	80 : 16 : 330

Serial No. & Sex of Captor		Prey	Locality	Date	Reference
		Andrenidae.			
14.	♀	**Andrena minutula*, Kirb., ♀	Forest of Dean, Gloucestershire	13.vi.23	41
15.	—	spp. indet.	England	—	54 : 7 : 274 ‡
		DIPTERA.			
		Tipulidae.			
16.	—	*Ptychoptera paludosa*, Mg.	Sweden	—	62 : 14 : 24 ‡
17.	—	*Tipula* sp.	France	—	71 : 22 : 48 ‡
		Asilidae.			
18.	♂	**Dioctria baumhaueri*, Mg.. ♂	New Forest	21.vi.05	30
		Pipunculidae.			
19.	—	*Pipunculus campestris*, Latr.	Marlborough, Wilts.	v.-vi.14	55 : 8 : 244 ‡-(7)
		Cordyluridae.			
20.	—	*Scatophaga stercoraria*, L. [*merdaria* F.]	France	—	71 : 22 : 48 ‡
		Sciomyzidae.			
21.	—	*Dryomyza anilis*, Fall.	,,	—	,,

Dioctria cothurnata, Mg.

		HYMENOPTERA.			
		Ichneumonidae.			
1.	♂	**Ichneumon basiglyptus*, Kn., ♂	New Forest	31.vii.15	59

Dioctria rufipes, De G.

		HEMIPTERA.			
		Capsidae.			
1.	♂	*Miris calcaratus*, Fln.	Burnham Beeches, Bucks.	27.vi.24	77 : 25 : 606

(7).—"Its prey seemed to consist, in all the cases I observed, of *Pipunculus campestris*, Latr."

Serial No. & Sex of Captor		Prey	Locality	Date	Reference
		HYMENOPTERA.			
		Tenthredinidae.			
2.	♀	**Ametastegia glabrata*, Falls., ♀	Dartford, Kent	13.vi.09	80
3.	♀	†*Blenocampa assimilis*, Fln., ♀	Ledbury, Heref.	4.vi.95	80 : **13** : 333–(8)
4.	♂	**Dineura stilata*, Klug., ♂	Gog Magog Hills, Cambs.	3.v.28	67
		Ichneumonidae.			
5.	♀	**Angitia* sp., ? *interrupta* Holmgr., ♀	—	—	,,
6.	♀	†*Barichneumon semirufus*, Grav., or *bimaculatus*, Grav., ♂	Otford, Kent	21.vi.02	80
7.	—	*Cratocryptus* sp.	Sweden	—	62 : **14** : 22 ‡–(9)
8.	—	*Hypamblys transfuga*, Thoms.	,,	—	,,
9.	—	*Hypomecus quadrimaculatus*.	,,	—	,,
10.	—	*Ischnus nigricollis*, Westm.	,,	—	,,
11.	—	*Microcryptus basizonius*, [Grav.]	,,	—	,,
12.	♀	**Pimpla* (*Tromatobia*) *oculatoria*, F., ♀	Cowley, Oxfordshire	—	67
13.	♀	**Pimpla* sp.,? *detrita*, Hgr., or *calobata*, Grav., ♂	Gog Magog Hills, Cambs.	3.v.28	67
14.	♀ ?	sp. indet.	Heston, Middlesex	14.vii.24	77 : **25** : 606
15.	—	,,	Sweden	—	61 : **14** : 23 ‡
		Braconidae.			
16.	—	*Alysia* sp.	,,	—	62 : **14** : 22 ‡
17.	♀	**Bracon* sp., ♂	Iver, Bucks.	7.vi.30	67
18.	♂	*Probably *Bracon* sp., ♀	Leatherhead, Surrey	23.vi.28	67
		Andrenidae.			
19.	—	*Sphecodes* sp.	Denmark	—	60 : **12** : 17 ‡
		DIPTERA.			
		Bibionidae.			
20.	♀	*Bibio pomonae*, F., ♂	Heston, Middlesex	30.vi.24	77 : **25** : 606

(8).—Originally recorded as an Ichneumon.

(9).—Also other undetermined Parasitica.

Serial No. & Sex of Captor		Prey	Locality	Date	Reference
		Tipulidae.			
21.	♂	*Tipula oleracea*, L.	Heston, Middlesex	12.vi.24	77 : 25 : 606
		Stratiomyidae.			
22.	♀ ?	*Chloromyia formosa*, Scop.. ♀	,, ,,	12.vii.24	,,
		Empidae.			
23.	♂ ?	**Empis pennipes*, L., ♀	Cusop, Herefordshire	11.vi.02	80 : 16 : 330
		Syrphidae.			
24.	♀	**Sphegina clunipes*, Fln., ♀	,, ,,	,,	,,
25.	♀	**Syritta pipiens*, L., ♀	Iver, Bucks.	9.vi.28	67
		Anthomyidae.			
26.	♀	*Musca domestica*, L., ♀	Heston, Middlesex	8.vii.24	77 : 25 : 606
		Cordyluridae.			
27.	♀	**Parallelomma albipes*, Fln.. ♂	Shotover, Oxford	—	67
28.	♂	**Scatophaga stercoraria*, F.. ♀	Dartford, Kent	13.vi.02	80
		Sphaeroceridae.			
29.	♀ ?	*Copromyza* [*Borborus*] *equina*, Fln.	Heston, Middlesex	12.vii.24	75 : 25 : 606
30.	♀	*Fragment, family indet.	Folkestone Warren, Kent	4.vi.06	30

Dioctria baumhaueri, Mg.

		HYMENOPTERA.			
1.	♀	*Lissonota sulphurifera*, Grav., ♀	Heston, Middlesex	14.vii.24	77 : 25 : 607–(10)
2.	♀	,, ,, ♀	,, ,,	,,	,,
3.	♀	,, ,, ♀	,, ,,	,,	,,
4.	♀	‖*Microcryptus galactinus*, Grav., ♂	Bickleigh, Devon	24.vi.82	32 : 16 : 331
		Braconidae.			
5.	♂	**Aphidius avenae*, Hal., ♂	Lye Hill, Oxford	11.vii.09	47
6.	♂	**Apanteles* sp., ♀	Iver, Bucks.	7.vi.30	67

(10).—" The Ichneumons, of which there were a great many, were being extensively preyed upon . . . . . , but I was only able to record definitely the above three instances."

Serial No. & Sex of Captor		Prey	Locality	Date	Reference
7.	♂	Parasitic sp., family indet.	Heston, Middlesex	4.vi.24	77 : **25** : 607
		Pemphredonidae.			
8.	♂	**Diodontus minutus*, F., ♂	Oxshott, Surrey	7.vii.28	67
		Crabronidae.			
9.	♀	**Entomognathus brevis*, V. de Lind., ♂	Tubney, Berks.	3.vii.15	39
		Andrenidae.			
10.	♀	*Halictus fulvicornis*, Kirb., ♀	Heston, Middlesex	14.vii.24	77 : **25** : 607
		DIPTERA.			
		Chironomidae.			
11.	♀	sp. indet.	Heston, Middlesex	4.vi.24	77 : **25** : 607
		Empidae.			
12.	♀	*Hybos* sp.	,, ,,	7.vi.24	,,
13.	♀	**Rhamphomyia* sp., ♀	Farningham, Kent	3.vii.27	30 : **19** : 23
14.	♂	**Tachydromia interstincta*, Collin, ♀	Kimbers Wood, Oxford	18.vii.08	47
		Syrphidae.			
15.	♀	*Syrphus corollae*, F., ♀	Heston, Middlesex	6.vii.24	77 : **25** : 607
16.	♀	**Ascia podagrica*, F., ♀	Hogley Bog, Oxford	19.vii.08	47

Dioctria linearis, Fall.

		DIPTERA.			
		Empidae.			
1.	—	*Empis pennipes*, L.	France	—	71 : **22** : 47 ‡
		Anthomyidae.			
2.	—	*Fannia* sp.	,,	—	,,
3.	—	*Hydrotaea* sp.	,,	—	,,
4.	—	*Coenosia tigrina*, F.	,,	—	,,
		Cordyluridae.			
5.	—	*Scatophaga stercoraria*, L.	,,	—	,,

Laphria flava, L.

Serial No. & Sex of Captor		Prey	Locality	Date	Reference
		HEMIPTERA.			
		Pentatomidae.			
1.	—	*Eurydema oleracea*, F.	Sweden	—	62 : **14** : 30 ‡
		Homoptera.			
2.	—	spp. indet.	,,	—	,,
		MECOPTERA.			
		Panorpidae.			
3.	—	*Panorpa communis* L.	,,	—	44 : **14** : 30 ‡
		HYMENOPTERA.			
		Ichneumonidae.			
4.	—	**Meniscus impressor*, Grav., ♂	Hartz Mts., Germany	vii.21	52 : **17** : xlix.
		Formicidae.			
5.	—	*Acanthomyops* [*Lasius*] *niger*, L.	Sweden	—	62 : **14** : 30 ‡
6.	♀	**Formica rufa*, L., ♂	La Granja, Spain	30.vii.04	35 : **16** : 340
		COLEOPTERA.			
		Coccinellidae.			
7.	—	*Coccinella 7-punctata*, L.	Sweden	—	62: **14**: 30 ‡—(11)
8.	♀	* ,, ,,	Hartz Mts., Germany	vii.21	52 : **17** : xlix. ‡ —(12)
9.	—	*Calvia* [*Halyzia*] *14-guttata*, L.	Sweden	—	62 : **14** : 30 ‡
		Scarabaeidae.			
10.	—	*Phyllopertha horticola*, L.	Germany	—	45 : **3** : 313 ‡
11.	—	,, ,,	Sweden	—	62 : **14** : 30 ‡
		Chrysomelidae.			
12.	—	*Cassida viridis*, L.	,,	—	50 : **14** : 30
		Meloidae.			
13.	—	*Cantharis* sp.	,,	—	62 : **14** : 30 ‡
		Curculionidae.			
14.	—	sp. indet.	,,	—	,,

(11).—"*Coccinella* is often in a large majority."
(12).—"One of many seen . . . . devouring the same species, at the time particularly common and conspicuous."

Serial No. & Sex of Captor		Prey	Locality	Date	Reference
		DIPTERA.			
		Tipulidae.			
15.	—	*Limnobia 4-notata*, Mg.	Sweden	—	62 : **14** : 30 ‡
16.	—	,, *bifasciata*, Schrk.	,,	—	,,
17.	—	,, sp.	France	—	71 : **22** : 101 ‡
18.	—	*Tipula oleracea*, L.	,,	—	,,
19.	♂	* ,, *limitata*, Schum., ♀	Austria	—	67
20.	—	"A large Tipulid."	Sweden	—	62 : **14** : 30 ‡
		Bibionidae.			
21.	♂	**Bibio pomonae*, F., ♂	Nethy Bridge, Inverness	6.viii. 11	80
22.	♀	† ,, ,, ♂	,, ,,	,,	,,
		Asilidae.			
23.	—	*Laphria marginata*, L.	Sweden	—	62 : **14** : 30 ‡
		Empidae.			
24.	—	*Empis livida*, L.	,,	—	,,
		Syrphidae.			
25.	—	*Eristalis arbustorum*, L.	Austria	—	43 : **2** : 121 ‡
26.	—	,, *tenax*, L.	,,	—	,,
27.	—	*Myiatropa flava*, L.	,,	—	,,

Laphria marginata, L.

Serial No. & Sex of Captor		Prey	Locality	Date	Reference
		HEMIPTERA.			
		Cixiidae.			
1.	♂	**Cixius pilosus*, Ol., ♀	Lyndhurst, New Forest	22.vii.07	28
		COLEOPTERA.			
		Oedemeridae.			
2.	♀	*Oedemera* sp.	Sweden	—	69 : **14** : 36
		Curculionidae.			
3.	♂	**Phyllobius argentatus*, L., ♂	Darenth Wood, Kent	28.vi.08	30
		HYMENOPTERA.			
		Formicidae.			
4.	—	*Myrmica rubra*, L.,	Sweden	—	62 : **14** : 36 ‡
5.	♀	**Formica fusca*, L., ♀	New Forest	22.viii.06	30

Serial No. & Sex of Captor		Prey	Locality	Date	Reference
		DIPTERA.			
		Anthomyidae.			
6.	♀	*Mydaea? duplicata, Mg., ♀	Queen's Bower, New Forest	2.viii.07	31
7.	—	"Small flies," family indet.	Sweden	—	62 : **14** : 36 ‡

Philonicus albiceps, Mg.

Serial No. & Sex of Captor		Prey	Locality	Date	Reference
		ORTHOPTERA.			
		Acridiidae.			
1.	—	spp. indet.	Woolacombe, Devon	—	75 : **23** : xl. ‡
		HEMIPTERA.			
		Pentatomidae.			
2.	—	*Pentatoma* sp.	France	—	71 : **22** : 122 ‡
		Jassidae.			
3.	♂	"A little Cicada."	Sweden	—	62 : **14** : 38 ‡
		COLEOPTERA.			
		Anthicidae.			
4.	—	*Anthicus* sp.	,,	—	,,
		HYMENOPTERA.			
		Formicidae.			
5.	♀	**Formica fusca*, L., ♀	Pokesdown, Hants.	12.viii.08	47
		Andrenidae.			
6.	—	*Andrena* sp.	Sweden	—	50 : **14** : 38 ‡
7.	—	sp. indet.	,,	—	62 : **14** : 38 ‡
		DIPTERA.			
		Bibionidae.			
8.	—	*Aspistes berolinensis*, Mg.	,,	—	,,
		Chironomidae.			
9.	—	sp. indet.	,,	—	,,
		Tipulidae.			
10.	♂	**Tipula helvola*, Mg., ♂	Pokesdown, Hants.	12.viii.08	47—(13)
11.	♀	* ,, *paludosa*, Mg., ♀	Woolacombe, Devon	17.viii.08	58 : **9** : 75—(14)

(13).—Hitherto this Tipulid has only been taken by G. H. Verrall in Wales.
(14).—Originally recorded as *T. oleracea*, L.

Serial No. & Sex of Captor		Prey	Locality	Date	Reference
		Asilidae.			
12.	♀	*Philonicus albiceps*, Mg., ♀	Waterville, Kerry, Ireland	—	80:**24**:640‡–(15)
13.	—	,, ,, ? sex	,,	—	,,
14.	—	‖*Rhadiurgus variabilis*, Ztt.	Sweden	—	— : **14** : 38 ‡
15.	—	*Epitriptus cingulatus*, F.	,,	—	62 : **14** : 38 ‡
		Therevidae.			
16.	—	*Thereva annulata*, F.	,,	—	,,
		Dolichopodidae.			
17.	—	*Dolichopus* sp.	,,	—	,,
		Syrphidae.			
18.	♀	**Platychirus scambus*, Stg., ♀	Kenfig Sandhills, Glamorgan	12.viii.08	80
19.	♀	* ,, *fulviventris*, Macq., ♀	Aldeburgh, Suffolk	18.ix.07	80 : **24** : 640
20.	♀	* ,, sp., ♂	Pokesdown, Hants.	12.viii.08	47
21.	—	*Syrphus balteatus*, De G.	France	—	71 : **22** : 122 ‡
22.	♀	* ,, *corollae*, F., ♂	Woolacombe, Devon	25.ix.06	58
23.	♀	‖ ,, *ribesii*, L.,	Brandon, Suffolk	26.viii.06	63 : **16** : 347
		Tachinidae.			
24.	♀	**Sarcophaga* sp. ♀	Bridgend, Glam.	29.vii.08	80
25.	♀	* ,, ♀	Pokesdown, Hants.	12.viii.08	47
26.	♂	* ,, ♀	,, ,,	,,	,,
27.	♀	* ,, ? *carnaria*, L., ♂	Woolacombe, Devon	24.viii.06	58
28.	♀	**Pollenia rudis*, F., ♀	Braunton, Devon	10.viii.16	37
29.	—	*Lucilia caesar*, L.	France	—	71 : **22** : 122 ‡
30.	♀	* ,, sp. near *caesar*, L., ♀	Tresco, Scilly Isles	16.vii.27	67
31.	♀	,, sp.	Dooks, Kerry, Ireland	—	80 : **24** : 640
32.	—	,, *sericata*, Mg.	France	—	71 : **22** : 122 ‡
33.	♀	**Calliphora erythrocephala*, Mg., ♀	Woolacombe, Devon	1.ix.07	56 : **9** : 75 ‡–(16)
34.	♀	* ,, ,, ♀	Port Talbot, Glamorgan	28.vii.08	80

(15).—" On more than one occasion instances of cannibalism were met with, and one (at any rate) of these was that of a female preying on a female."

(16).—A ♂ attempted to pair with captor. Prey originally recorded as *C. vomitoria*, L.

Serial No. & Sex of Captor		Prey	Locality	Date	Reference
		Anthomyidae.			
35.	♀	† ? *Orthelia cornicina*, F. [*Lucilia* or *Euphoria*]	Dooks, Kerry, Ireland	15.viii.01	80 : **16** : 347
36.	♀	**Musca domestica*, L., ♀	Deal, Kent	v.viii.05	47—(17)
37.	—	*Phaonia errans*, Mg.	Sweden	—	62:**14**:38 ‡-(18)
38.	♀	* ,, [*Hyetodesia*] *signata*, Mg. ♂	Barmouth, Wales	7.vii.02	80 : **16** : 347
39.	—	,, [*Aricia*] *signata*, Mg.	France	—	71 : **22** : 122 ‡
40.	—	,, *basalis*, Ztt.	Sweden	—	62 : **14** : 38 ‡
41.	—	*Hydrotaea dentipes*, F.	,,	—	,,
42.	♂	**Fucellia maritima*, Hal., ♀	Studland, Dorset	22.viii.06	40 : **16** : 347
43.	—	,, sp.	Sweden	—	68 : **21** : 33 ‡
44.	—	*Chortophila* sp.	,,	—	62 : **14** : 38 ‡
45.	—	*Coenosia tigrina*, F.	France	—	71 : **22** : 122 ‡
46.	—	spp. indet.	Waterville, Kerry, Ireland	—	80 : **24** : 640 ‡
		Cordyluridae.			
47.	♀	**Scatophaga stercoraria*, L., ♂	Pokesdown, Hants.	12.viii.08	47
48.	—	,, ,, ?sex	France	—	71 : **22** : 122 ‡
49.	—	,, [*merdaria*, F.] ,,	,,	—	,,
50.	—	,, *litorea*, Fln.	Sweden	—	68 : **21** : 33 ‡
51.	—	[*Scopeuma littoreum*]	,,	—	62 : **14** : 38 ‡
		Phycodromidae.			
52.	—	*Orygma luctuosum*, Mg.	Waterville, Kerry, Ireland	—	80 : **24** : 640 ‡
53.	♂	* ,, ,, ♀	Tresco, Scilly Isles	16.vii.27	67
54.	—	* ,, ,, ♀	,, ,,	,,	,,
55.	—	* ,, ,, ♀	,, ,,	,,	,,
56.	—	* ,, ,, ♂	,, ,,	,,	,,
57.	—	**Coelopa pilipes*, Hal., ♀	,, ,,	,,	,,
		Sphaeroceridae.			
58.	—	*Sphaerocera* sp.	Sweden	—	62 : **14** : 38 ‡

(17).—Originally recorded (**16** : 355) as *Machimus atricapillus*, Fln., and *Sarcophaga ? melanura*, Mg.

(18).—Other undetermined Anthomyids taken.

Asilus crabroniformis, L.

Serial No. & Sex of Captor		Prey	Locality	Date	Reference
		ORTHOPTERA.			
		ACRIDIIDAE.			
1.	♀	**Gomphocerus maculatus*, Thunb., ♂	Corfe Castle, Dorset	2.ix.06	80 : **16** : 349
2.	♀	* ,, ,,	Beaulieu Rd., New Forest	25.vii.25	53 : **6** : 8
3.	—	,, sp.	Sweden	—	62 : **14** : 41 ‡
4.	—	**Mecostethus grossus*, L., ♂	New Forest	2.ix.06	59 : **16** : 349–(19)
5.	♀	**Stenobothrus viridulus*, L., ♀	,, ,,	22.viii.02	59 : **16** : 348
6.	♀	,, *bicolor*, Charp., ♀	Streatley, Berks.	1923-4	77 : **25** : 608–(21)
7.	—	,, ,, ♀	,, ,,	,,	,,
8.	—	,, ,, ? sex	,, ,,	,,	,,
9.	—	,, sp.	Sweden	—	62 : **14** : 41 ‡
10.	♂	**Chorthippus parallelus*, Ztt., ♀	Studland, Dorset	3.viii.09	80—(20)
11.	♀	**Calliptamus italicus*, L., ♂	Porquerolles, Var, France	31.viii.27	67
		LEPIDOPTERA.			
		LYCAENIDAE.			
12.	♀	**Lycaena corydon*, L., ♂	Sussex Downs	30.viii.30	42 : **20** : 87
13.	—	Moth, family indet.	Leatherhead, Surrey	17.viii.30	38 : **20** : 87
		COLEOPTERA.			
		STAPHYLINIDAE.			
14.	—	*Philonthus splendens*, F.	Sweden	—	62 : **14** : 41 ‡
		SILPHIDAE.			
15.	♀	**Necrophorus vespillo*, L.	Nr. Farningham, Kent	22.viii.26	30 : **1** : 159
		SCARABAEIDAE.			
16.	♀	**Onthophagus taurus*, L., ♀	Agay, Var, France	15.vii.26	67
17.	—	*Aphodius foetens*, F.	Sweden	—	62 : **14** : 41 ‡
18.	—	,, *fimetarius*, L.	,,	—	,,
19.	—	,, *contaminatus*, Herbst.	,,	—	,,
20.	♀	,, *rufipes*, L., ♂	Streatley, Berks.	1923-4	77 : **25** : 608
21.	—	,, ,, ♂	,, ,,	,,	,,

(19).—Prey originally recorded as a ♀.
(20).—The Asilid captor was attacked and killed by another ♂ *crabroniformis*. See Note (23).
(21).—F. G. S. Whitfield observed ♂ Asilids from 8.viii. to 29.viii. and ♀ Asilids from 6.viii. to 17.ix., 1923-4.

Serial No. & Sex of Captor		Prey	Locality	Date	Reference
		CANTHARIDAE.			
22.	—	?*Cantharis* [*Telephorus*] *rustica*, Fln.	Streatley, Berks.	1923-4	77 : **25** : 608
		CHRYSOMELIDAE.			
23.	—	**Sermyla halensis*, L.	Burley, New Forest	18.viii.03	66 : **16** : 348
24.	—	Beetles indet.	France	—	79 : **26** : 38 ‡
		HYMENOPTERA.			
		VESPIDAE.			
25.	♀	*Vespa germanica*, F., ♀	Streatley. Berks.	1923-4	77 : **25** : 608
26.	—	,, ,, ☿	,, ,,	,,	,,
		ANDRENIDAE.			
27.	♀ ?	*Andrena fulva*, Schr., ♀	,, ,,	,,	,,
		APIDAE.			
28.	♂	*Apis mellifica*, L., ☿	,, ,,	,,	,,
29.	♀ ?	,, ,, ☿	,, ,,	,,	,,
		DIPTERA.			
		TIPULIDAE.			
30.	♀	**Tipula paludosa*, Mg., ♀	Twitchen, Mortehoe, Devon	15.x.07	58 : **9** : 75—(22)
		TABANIDAE.			
31.	—	*Haematopota pluvialis*, L.	France	—	71 : **22** : 117 ‡
		ASILIDAE.			
32.	♂	**Asilus crabroniformis*, L., ♂	Studland, Dorset	3.viii.09	80—(23)
33.	♀	* ,, ,, ♂	Near Kings Somborne, Hants.	19.viii.30	46 : **4** : 110
34.	♀	,, ,, ♂	France		79 : **26** : 38 ‡
35.	♀	*Machimus atricapillus*, Fln., ♀	Streatley, Berks	1923-4	77 : **25** : 608
36.	♀	,, ,, ♀	,, ,,	,,	,,
37.	♀	,, ,, ♂	,, ,,	,,	,,
38.	—	Probably *Machimus atricapillus*, Fln.	Near Tavistock, Devon	1889	80 : **16** : 348
		EMPIDAE.			
39.	♀	*Empis livida*, L., ♀	Streatley, Berks.	1923-4	77 : **25** : 608

(22).—Originally recorded as a large Tipulid.
(23).—The Asilid victim was eating a grasshopper. See Note (20).

Serial No.	& Sex of Captor	Prey	Locality	Date	Reference
		SYRPHIDAE.			
40.	♀	*Volucella pellucens*, L., ♂	Streatley, Berks.	1923-4	77 : **25** : 608
41.	♂	,, ,, ♀	,, ,,	,,	,,
42.	♀	*Eristalis tenax*, L., ♀	,, ,,	,,	,,
43.	♀	,, ,, ♀	,, ,,	,,	,,
44.	♂	,, ,, ♂	,, ,,	,,	,,
45.	—	*Sericomyia borealis*, Fln.	Near Poole, Dorset	13.viii.04	40 : **16** : 348
		TACHINIDAE.			
46.	♀ ?	*Echinomyia* [*Tachina*] *fera*, L., ♀	Streatley, Berks.	1923-4	77 : **25** : 608
47.	—	*Sarcophaga haemorrhoidalis*, Mg.	France	—	71 : **22** : 117 ‡
48.	♀	* ,, *carnaria*, L., ♂	Walton-on-Naze, Essex	15.vi.08	80
49.	♀ ?	,, ,, —	Streatley, Berks.	1923-4	77 : **25** : 608
50.	—	,, ,, —	Near Poole, Dorset	13.viii.04	76 : **16** : 348
51.	♀	**Lucilia caesar*, L., ♂	Torcross, Devon	17.viii.03	80 : **16** : 348
52.	—	,, *sericata*, L.	France	—	71 : **22** : 117 ‡
53.	♂	**Calliphora erythrocephala*, Mg., ♂	Near Bude, Cornwall	18.ix.10	78
54.	♂	,, ,, —	Streatley, Berks.	1923-4	77 : **25** : 608
55.	♀	,, ,, ♀	,, ,,	,,	,,
56.	♀ ?	,, ,, ♀	,, ,,	,,	,,
57.	♀	,, sp.	,, ,,	,,	,,
		ANTHOMYIDAE.			
58.	♂	*Mesembrina meridiana*, L., ♂	,, ,,	,,	,,
59.	♀	,, ,, ♂	,, ,,	,,	,,
60.	♀	,, ,, —	,, ,,	,,	,,
61.	♀	,, ,, ♀	,, ,,	,,	,,
62.	—	*Musca autumnalis*, De G., [*corvina*, F.]	France	—	71 : **22** : 117 ‡
63.	—	*Polietes lardaria*, F.	,,	—	,,
64.	♀ ?	*Phaonia erratica*, Fln., ♂	Streatley, Berks.	1923-4	77 : **25** : 608
65.	♀ ?	,, ,, ♀	,, ,,	,,	,,
66.	—	Small spp. indet.	Woolacombe, Devon	—	75:**23**: xl. ‡-(24)

(24).—On one occasion *crabroniformis* appeared to confine its attacks to small Diptera.

Rhadiurgus variabilis, Ztt.

Serial No. & Sex of Captor		Prey	Locality	Date	Reference
		ORTHOPTERA.			
		Blattidae.			
1.	—	*Ectobia lapponica*, L.	Sweden	—	62 : **14** : 42 ‡
		NEUROPTERA.			
		Hemerobiidae.			
2.	—	*Hemerobius* sp.	,,	—	,,
		LEPIDOPTERA.			
		Pyralidae.			
3.	—	Several spp. indet.	,,	—	,,
		DIPTERA.			
		Empidae.			
4.	—	*Hybos* sp.	,,	—	,,

Pamponerus germanicus, L.

Serial No. & Sex of Captor		Prey	Locality	Date	Reference
		COLEOPTERA.			
		Scarabaeidae.			
1.	—	*Aphodius* sp. [? *fimetarius*, L.]	Barmouth, Wales	27.vi.02	80 : **24** : 657
2.	—	,, sp.	France	—	65 : **22** : 113 ‡
3.	♀	**Hoplia philanthus*, Füss., ♂	Barmouth, Wales	27.vi.02	80 : **16** : 348
4.	♀	* ,, *farinosa*, L., ♂	V. di Sula, Piedmont, Italy	—	—
5.	—	||*Phyllopertha horticola*, L.	Sweden	—	— : **14** : 40
6	—	,, ,,	Germany	—	81 : **27** : 53 ‡
		HYMENOPTERA.			
		Tenthredinidae.			
7.	—	*Dolerus niger*, Jur.	,,	—	,,
8.	—	*Nematinus fuscipennis*, [Steph.]	Sweden	—	62 : **14** : 40 ‡
9.	—	*Tenthredo atra*, L.	,,	—	,,
		Ichneumonidae.			
11.	—	*Hadrodactylus flavifrontator*, Thunb.	,,	—	,,
		DIPTERA.			
		Bibionidae.			
11.	—	*Bibio* sp.	France	—	57 : **22** : 113 ‡

Dysmachus trigonus, Mg.

Serial No. & Sex of Captor		Prey	Locality	Date	Reference
		LEPIDOPTERA. Tortricidae.			
1.	♂	**Tortrix viridana*, L., ♂	New Forest	3.vii.22	59 : **11** : 20
		Pyralidae.			
2.	♀	**Crambus pratellus*, Clk., ♀	Tubney, Berks.	26.vi.05	39 : **16** : 350
		COLEOPTERA. Scarabaeidae.			
3.	♂	**Onthophagus fracticornis*, Preyss., ♀	Deal, Kent	6.viii.05	47 : **16** : 350
		HYMENOPTERA. Ichneumonidae.			
4.	♀	**Angitia fenestralis*, Holmgr., ♀	,, ,,	1.viii.05	,,
		Pompilidae.			
5.	♀	**Pompilus plumbeus*, F., ♂	Tubney, Berks.	28.vi.09	47
		DIPTERA. Mycetophilidae.			
6.	—	*Sciara* sp.	France	—	71 : **22** : 145 ‡
		Stratiomyidae.			
7.	♀	**Chloromyia formosa*, Scop., ♀	Barmouth, Wales	25.vi.02	80 : **16** : 350
		Asilidae.			
8.	—	*Philonicus albiceps*, Mg.,	,, ,,	—	34 : **24** : 664
		Therevidae.			
9.	♂	**Thereva annulata*, F., ♂	Palling, Norfolk	4.vii.05	30
		Empidae.			
10.	—	*Empis* sp.	France	—	71 : **22** : 145 ‡
11.	♀	**Hilara* sp., ♀	Tubney, Berks.	10.vii.04	47 : **16** : 350
		Tachinidae.			
12.	♀	**Pollenia rudis*, F., ♀	,, ,,	21.vii.07	47
13.	♀	**Calliphora erythrocephala*, Mg., ♀	,, ,,	28.vi.09	,,

Serial No. & Sex of Captor		Prey	Locality	Date	Reference
14.	♀	* *Calliphora erythrocephala*, Mg., ♀	Palling, Norfolk	5.vii.05	30
15.	♀	* *Alophora hemiptera*, F., ♂	Lyndhurst, New Forest	4.vii.07	28
16.	♂	* sp. indet.	Tubney, Berks.	21.vii.07	47
		Anthomyidae.			
17.	♂	* *Mydaea urbana*, Mg., ♂	St. Brelade, Jersey	—vi.03	73 : **16** : 350
		Cordyluridae.			
18.	♀	* *Scatophaga litorea*, Fln., ♀	Hunstanton, Norfolk	1.vii.23	41
		Sciomyzidae.			
19.	♀	* *Oedoparea buccata*, Fln., ♂	Littlehampton, Sussex	23.vi.24	30 : **18** : 13

Eutolmus rufibarbis, Mg.

		LEPIDOPTERA.			
		Geometridae.			
1.	—	sp. indet.	Sweden	—	62 : **14** : 45 ‡
		HYMENOPTERA.			
		Formicidae.			
2.	—	*Acanthomyops* [*Lasius*] *niger*, L.	,,	—	,,
		DIPTERA.			
		Therevidae.			
3.	♀	* *Thereva* sp., ? *plebia*, L., ♂	Near Farningham, Kent	1.viii.25	28 : **1** : 159—(25)
4.	♀	* ,, ,, —	,, ,,	,,	,,
		Empidae.			
5.	—	*Empis tessellata*, F.	France	—	71 : **22** : 149 ‡
		Syrphidae.			
6.	—	*Chilosia* sp.	Sweden	—	62 : **14** : 45 ‡
7.	♀	* *Melanostoma* sp., ? *ambiguum*, Fln., ♀	Besse-en Chandesse, Puy de Dome, France	22.vii.26	67
		Tachinidae.			
8.	—	*Sarcophaga* sp.	France	—	71 : **22** : 149 ‡
9.	—	*Lucilia sericata*, Mg.	,,	—	,,

(25).—Originally recorded as *T. nobilitata*, F., but see **18** : 13.

Machimus atricapillus, Fln.

Serial No. & Sex of Cator		Prey	Locality	Date	Reference
		HEMIPTERA.			
		Reduviidae.			
1.	♂	*Nabis major*, Cost., ♂	Streatley, Berks.	12.viii.24	77 : **25** : 609
		Cercopidae.			
2.	♀	**Athysanus* sp.,? *communis*, Sahl.	Newton Abbot, Devon	30.vii.06	47 : **16** : 355–(26)
		Jassidae.			
3.	♀	**Typhlocyba* sp.,? *lethieryi*, Edw., ♀	Near Latimer, Herts.	16.ix.28	67
4.	—	Various spp. indet.	Sweden	—	62 : **14** : 46 ‡
		Aphidae.			
5.	—	Various spp. indet.	,,	—	,,
6.	♂	**Anoecia corni*, F., alate ♀	Near Latimer, Herts.	16.ix.28	67
		LEPIDOPTERA.			
		Nymphalidae.			
7.	♀	†*Coenonympha pamphilus*, L.	Tring, Herts.	19.viii.11	70
		Geometridae.			
8.	♀	**Eupithecia* sp., ♀	Royston, Herts.	3.viii.14	38
		Pyralidae.			
9.	♂	**Crambus culmellus*, L., ♀	Box Hill, Surrey	26.vii.08	,,
10.	—	A moth, sp. & family indet.	Sweden	—	62 : **14** : 46 ‡
		COLEOPTERA.			
		Scarabaeidae.			
11.	♂	*Aphodius contaminatus*, Herbst., ♂	Streatley, Berks.	6.viii.23	77 : **25** : 609
12.	—	,, sp.	Sweden	—	62 : **14** : 46 ‡
13.	♂	**Sitones hispidulus*, F., ♂	Near Winchester, Hants	27.viii.30	49
		HYMENOPTERA.			
		Braconidae.			
14.	—	*Alysia* sp.	Sweden	—	62 : **14** : 46 ‡

(26).—♂ and ♀ Asilid *in cop.*, ♀ with prey.

Serial No. & Sex of Captor		Prey	Locality	Date	Reference
		Formicidae.			
15.	♀	*Myrmica ruginodis*, Nyl., ♀	New Mill, Cornwall	8.viii.24	67
16.	—	,, *rubra*, L.	Sweden	—	62 : **14** : 46 ‡
17.	—	*Acanthomyops* [*Lasius*] *niger*, L.	,,	—	,,
18.	♀	* ,, sp., ♀	Mende, Lozère, France	10.viii.27	67—(26)
		Eumenidae.			
19.	♂	*Odynerus trifasciatus*, Oliv., ♀	Streatley, Berks.	19.viii.24	77 : **25** : 609
20.	♂	,, ,, ♀	,, ,,	7.ix.23	,,
		Andrenidae.			
21.	—	*Halictus smeathmanellus*, Kirb., ♀	,, ,,	30.viii.23	,,
		DIPTERA.			
		Mycetophilidae.			
22.	—	spp. indet.	Sweden	—	62 : **14** : 46 ‡
		Psychodidae.			
23.	♂	**Pericoma* sp., ♀	Near Latimer, Herts.	16.ix.28	67
		Tipulidae.			
24.	♀	**Dicranomyia dumetorum*, Mg., ♀	Queen's Bower, New Forest	31.vii.07	64
25.	♂	*Tipula oleracea*, L., ♀	Streatley, Berks.	6.viii.23	77 : **25** : 609
26.	—	Small sp. indet.	,, ,,	17.viii.23	,,
		Rhyphidae.			
27.	♀	*Rhyphus punctatus*, F., ♀	,, ,,	28.viii.24	,,
28.	♀	,, ,, ♂	,, ,,	,,	,,
29.	♂?	,, ,, ♀	,, ,,	,,	,,
30.	♂?	,, ,, —	,, ,,	,,	,,
31.	♂?	,, ,, —	,, ,,	30.viii.24	,,
		Tabanidae.			
32.	♀	†*Chrysops caecutiens*, L., ♂	Brockenhurst, New Forest	14.vi.94	80 : **13** : 333
		Leptidae.			
33.	—	*Leptis lineola*, F.,	Sweden	—	62 : **14** : 46 ‡

(26).—♂ and ♀ Asilid *in cop.*, ♀ with prey.

Serial No. & Sex of Captor		Prey	Locality	Date	Reference
		Empidae.			
34.	—	*Empis livida*, L., ♂	Streatley, Berks.	11.ix.23	77 : **25** : 609
		Dolichopodidae.			
35.	♀	**Dolichopus ungulatus*, L., ♀	Deal, Kent	9.vii.04	36 : **16** : 355
36.	♂	**Chrysotus laesus*, W., ♂	Brockenhurst, New Forest	29.vii.07	47
		Pipunculidae.			
37.	—	*Pipunculus* sp.	Sweden	—	62 : **14** : 46 ‡
		Syrphidae.			
38.	—	*Chrysogaster* sp.	,,	—	,,
39.	♀	**Rhingia campestris*, Mg., ♀	Near Winchester, Hants.	28.viii.30	49
40.	♀	**Platychirus albimanus*, F., ♀	Near Latimer, Herts.	16.ix.28	67
41.	♂	**Melanostoma mellinum*, L., ♀	Brockenhurst, New Forest	29.vii.07	31
42.	♀	* ,, *scalare*, F., ♀	New Forest, Hants.	24.viii.02	59 : **16** : 355
43.	—	,, sp.	Sweden	—	62 : **14** : 46 ‡
		Conopidae.			
44.	♂	*Sicus ferrugineus*, L., ♂	Streatley, Berks.	9.viii.24	77 : **25** : 609
		Tachinidae.			
45.	—	*Rhinophora melania*, Mg.	Sweden	—	62 : **14** : 46 ‡
46.	♀	**Sarcophaga* sp.? *melanura*, Mg., ♀	Deal, Kent	6.viii.05	47 : **16** : 355
47.	♀	,, *carnaria*, L.	Streatley, Berks.	15.ix.24	77 : **25** : 609
48.	♀	**Pollenia rudis*, F., ♂	Brockenhurst, New Forest	29.vii.07	47
49.	♀	* ,, ,, ♀	Lyndhurst, New Forest	6.iv.09	80
50.	♀	* ,, ,, ♂	Brockenhurst, New Forest	5.ix.09	,,
51.	—	,, ,, —	France	—	71 : **22** : 156 ‡
52.	♀	*Lucilia caesar*, L., ♀	Streatley, Berks.	7.ix.24	77 : **25** : 609
53.	♀	,, ,, —	,, ,,	13.viii.23	,,
54.	♂	,, ,, ♂	,, ,,	9.viii.24	,,
55.	—	*Calliphora erythrocephala*, Mg.	France	—	71 : **22** : 156 ‡
56.	♂	**Degeeria luctuosa*, Mg., ♀	Near Winchester, Hants.	—	49
57.	♀	* sp. indet., ♀	Emery Down, New Forest	2.viii.07	47

Serial No. & Sex of Captor		Prey	Locality	Date	Reference
		Anthomyidae.			
58.	—	*Musca tempestiva*, Fln.	Sweden	—	62 : 14 : 46 ‡
59.	—	,, *domestica*, L.	,,	—	,,
60.	♂	,, ,, ♀	Streatley, Berks.	4.viii.24	77 : 25 : 609
61.	♀	* ,, *autumnalis*, De G., ♂	Beaulieu Road, New Forest	1.viii.07	47
62.	♂	**Muscina assimilis*, Fln., ♀	Brockenhurst, New Forest	29.vii.07	,,
63.	♂	‖*Stomoxys calcitrans*, L., ♂	Brandon, Warwicks.	21.ix.19	74
64.	♂	‖ ,, ,, ♂	,, ,,	,,	,,
65.	♀	‖ ,, ,, ♂	,, ,,	,,	,,
66.	♀	‖ ,, ,, ♂	,, ,,	,,	,,
67.	♀	,, ,, ♂	Heston, Middlesex	26.vii.24	77 : 25 : 609
68.	♀	,, ,, ♀	Streatley, Berks.	9.ix.23	,,
69.	—	,, ,, —	Sweden	—	62 : 14 : 46 ‡
70.	—	*Lasiops hirsutula*	,,	—	,,
71.	♀	**Helina lucorum*, Fln., ♂	Nr. Latimer, Herts.	16.ix.28	67
72.	♂	* ,, ,, ♂	,, ,, ,,	,,	,,
73.	—	*Hydrotea irritans*, Fln.	Sweden	—	62 : 14 : 46 ‡
74.	♂	* ,, ,, ♀	Near Winchester, Hants.	24.viii.30	49
75.	—	*Fannia* [*Homalomyia*] *scalaris*, F.	Denmark	—	60:12:79 ‡-(27)
76.	—	* ? *Fannia* sp., ♀	Brockenhurst, New Forest	29.vii.07	31
77.	—	*Mydaea impuncta*, Fln.	Streatley, Berks.	16.viii.23	77 : 25 : 609
78.	♂	* ,, ,, ♀	New Forest	30.ix.02	30
79.	♀	*Anthomyia pluvialis*, L.	Heston, Middlesex	22.vii.24	77 : 25 : 609
80.	♂	**Egle dissecta*, Mg., ♂	New Park, New Forest	2.viii.07	31
81.	♀	**Chortophila cilicrura*, Rnd., ♂	Emery Down, New Forest	,,	47
82.	—	*Hylemyia* [*Chortophila*] *floralis*, Fln.	Sweden	—	62 : 14 : 46 ‡
83.	♂	**Hylemyia* sp. ♂	Cusop Dingle, Heref.	26.vii.02	80 : 16 : 355
84.	♀	* sp. indet., ♀	Cholsey, Berks.	11.vii.27	41
		Cordyluridae.			
85.	♀	*Scatophaga stercoraria*, L., ♀	Heston, Middlesex	26.vii.24	77 : 25 : 609

(27).—Some authors include this record under *Dioctria atricapilla*, Mg., as well as under *Machimus atricapillus*, Fln.

Serial No. & Sex of Captor		Prey	Locality	Date	Locality
		Opomyzidae.			
86.	♂	*Opomyza germinationis, L., ♀	Near Winchester, Hants.	28.viii.30	49
		Sapromyzidae.			
87.	♂	*Sapromyza praeusta, Fln., ♀	Nr. Latimer, Herts.	16.ix.28	67
		Phoridae.			
88.	—	Sp. indet.	Sweden	—	62 : 14 : 46 ‡
		Psilidae.			
89.	—	*Psila gracilis*, Mg.	,,	—	,, —(28)
90.	♂	*Small Acalypterate indet. ♀	Waidbruck, Tyrol, Italy	24.viii.25	67
91.	♂	*Small sp. indet.	Brockenhurst, New Forest	29.vii.07	47

Machimus rusticus, Mg.

		LEPIDOPTERA.			
		Lycaenidae.			
1.	♀	**Lycaena corydon*, L., ♂	Sussex Downs	24.viii.30	56 : 20 : 87
		COLEOPTERA.			
		Dascillidae.			
2.	♀	**Dascillus cervinus*, L., ♂	Sondrio, N. Italy	29.vi.01	— : 20 : 87

Epitriptus cingulatus, F.

		HEMIPTERA.			
		Jassidae.			
1.	♂	**Dicraneura similis*, Edw., ♂	Longdown, New Forest	10.ix.30	49
2.	—	Various [Cicadidae] spp. indet.	Sweden	—	62 : 14 : 52 ‡
		Aphidae.			
3.	—	Various spp. indet.	,,	—	,,
4.	♂	**Thecabius affinis*, Kalt.	Longdown, New Forest	7.ix.30	49

(28).—Also *Hoplochaeta pupillata* and other Acalypterates taken as prey.

Serial No. & Sex of Captor		Prey	Locality	Date	Reference
		LEPIDOPTERA.			
		Tineidae..			
5.	♀	**Simaëthis fabriciana*, L.	Shotover, Oxford	1.vii.00	47 : **16** : 357
		DIPTERA.			
		Mycetophilidae.			
6.	—	sp. indet.	Sweden	—	62 : **14** : 52 ‡
		Syrphidae.			
7.	♂	**Melanostoma mellinum*, L., ♂	Treen, Cornwall	22.vii.27	67
		Tachinidae.			
8.	♂	**Calliphora erythrocephala*, Mg., ♀	,, ,,	,,	,,
9.	♀	* ,, ,, ♂	Longdown, New Forest	10.ix.30	49
		Anthomyidae.			
10.	♀	**Musca autumnalis*, De G., ♂	,, ,,	,,	,,
11.	♀	* ,, ,, [*corvina*, F.] ♂	Walton, Surrey	8.viii.03	72 : **16** : 357
12.	♀	**Muscina stabulans*, Fln., ♂	St. Mary's, Scilly Isles	9.vii.27	33
13.	♀	**Helina communis*, Dsv., ♂	Beaulieu Road, New Forest	1.viii.07	47
14.	♂	* ,, *nivalis*, Ztt., ♀	Longdown New Forest	10.ix.30	49
15.	—	*Hydrotaea* sp.	Sweden	—	62 : **14** : 52 ‡
		Sepsidae.			
16.	♀	**Nemopoda cylindrica*, F., ♀	Longdown, New Forest	10.ix.30	49—(29)
		Chloropidae.			
17.	—	*Meromyza pratorum*, Mg.	Sweden	—	62:**14**:52 ‡-(30)
		Sphaerocridae.			
18.	♀	**Copromyza hirtipes*, R-D., ♀	Longdown, New Forest	10.ix.30	49

(29).—♂ and ♀ Asilid *in cop.*, ♀ with prey.

(30).—Other undetermined Acalypterates taken.

Neoitamus cyanurus, Lw.

Serial No. & Sex of Captor		Prey	Locality	Date	Reference
		ODONATA.			
		Agrionidae.			
1.	♀	*Agrion pulchellum*, Lind.	Sweden	—	62 : **14** : 49 & 215—(31)
		HEMIPTERA.			
		Cimicidae.			
2.	♀	**Anthocoris sylvestris*, L.	Pamber Forest, Hants.	30.v.03	41 : **16** : 356
		NEUROPTERA.			
		Chrysopidae.			
3.	♀	**Chrysopa prasina*, Burm.	Hurn, Hants.	12.vii.30	53
		LEPIDOPTERA.			
		Hepialidae.			
4.	♂	‖ *Hepialus hectus*, L., ♂	Ipswich, Suffolk	13.vi.96	63 : **15** : 182
		Tineidae.			
5.	—	*Argyresthia gaedartella*, L.	Sweden	—	62:**14**:49 ‡–(32)
		Tortricidae.			
6.	♀	**Cacoecia* sp.? *lecheana*, L., ♂	Darenth Wood, Kent	3.vii.09	41
7.	♀	* ,, ,, ♂	,, ,,	,,	,,
8.	—	*Tortrix viridana*, L.	,, ,,	18.vi.68	76:**24**:683 ‡–(33)
		Cochlidae.			
9.	—	*Apoda limacodes*, Hufn. [*Limacodes testudo*, Sch.]	France	—	71 : **22** : 120 ‡
		Geometridae.			
10.	—	spp. indet.	Darenth Wood, Kent	18.vi.68	76 : **24** : 683 ‡
11.	♀	**Cabera pusaria*, L., ♀	Pamber Forest, Hants.	11.vi.21	66
		COLEOPTERA.			
		Scarabaeidae.			
12.	♀	†*Aphodius fimetarius*, L., ♀	Lyndhurst, New Forest	25.vi.94	80 : **13** : 333

(31).—♂ and ♀ Asilid *in cop.*, ♀ with prey.

(32).—Several other undetermined moths taken.

(33).—Taken in considerable numbers. See p. 10.

Serial No. & Sex of Captor		Prey	Locality	Date	Reference
		Elateridae.			
13.	♀	**Dolopius marginatus*, L.	Farningham, Kent	17.vi.06	30
		Curculionidae.			
14.	♀	**Polydrusus cervinus*, L., ♀	Tubney, Berks.	10.vi.06	39 : **16** : 357
15.	♂	* ,, ,, ♀	Farningham, Kent	17.vi.06	30
16.	♀	**Phyllobius pyri*, L., ♂	Near Abingdon, Berks.	5.vi.15	38
		HYMENOPTERA.			
		Ichneumonidae.			
17.	♀	Large sp. indet.	Denmark	—	60 : **12** : 82
		DIPTERA.			
		Mycetophilidae.			
18.	—	sp. indet.	Sweden	—	60 : **14** : 48 ‡
		Chironomidae.			
19.	—	*Chironomus* sp.	France	—	71 : **22** : 120 ‡
		Tipulidae.			
20.	—	*Ptychoptera paludosa*, Mg.	Sweden	—	62 : **14** : 48 ‡
21.	—	*Pachyrrhina histrio*, F.	France	—	71 : **22** : 120 ‡
22.	♀	**Tipula scripta*, Mg., ♂	Barmouth, Wales	6.vii.02	80 : **16** : 356-(34)
23.	—	,, ,, —	Sweden	—	62 : **14** : 48 ‡
24.	—	,, *oleracea*, L.	France	—	71 : **22** : 120 ‡
25.	—	,, *paludosa*, Mg.	,,	—	,,
26.	—	Large spp. indet.	Sweden	—	62 : **14** : 48 ‡
		Tabanidae.			
27.	—	*Tabanus bromius*, L.	France	—	71 : **22** : 120 ‡
		Asilidae.			
28.	♀	*Neoitamus cyanurus*, Lw., ♀	Denmark	—	60 : **12** : 81
29.	♀	‖ ,, ,, ♂	Germany	—	48 : **5** : 93—(35)
30.	♂	* ,, ,, ♂	Farningham, Kent	3.vii.27	30 : **19** : 23
		Empidae.			
31.	♀	**Empis punctata*, Mg., ♀	Tubney, Berks.	10.vi.06	39 : **16** : 357
32.	—	,, *pennipes*, L.	France	—	71 : **22** : 120 ‡
33.	♀	,, sp.	Sweden	—	62 : **14** : 48 ‡
34.	♂	**Tachydromia annulipes*, Mg., ♀	Bexley, Kent	20.vi.08	30

(34).—♂ and ♀ Asilid *in cop.*, ♀ with prey.
(35).—" Dass ♀ hat nach der Begattung das ♂ getödet und saugt es aus." See p. 13.

Serial No. & Sex of Captor		Prey	Locality	Date	Reference
		SYRPHIDAE.			
35.	—	*Chrysogaster metallina*, F.	France	—	71 : **22** : 120 ‡
36.	—	,, sp.	Sweden	—	62 : **14** : 48 ‡
37.	♀	**Syrphus nitidicollis*, Mg., ♀	Tubney, Berks.	10.vi.06	47 : **16** : 356
38.	—	,, *balteatus*, De G.	France	—	71 : **22** : 120 ‡
39.	—	,, *glaucius*, F.	,,	—	,,
40.	—	*Volucella inflata*, F.	,,	—	,,
		CONOPIDAE.			
41.	♀	**Myopa buccata*, L., ♂	Bagley Wood, Berks.	10.vi.05	47 : **16** : 356
		TACHINIDAE.			
42.	♀	**Ernestia* [*Varichaeta*] *nemorum*, Mg., ♀	Newlands Corner, Surrey	18.vi.04	59 : **16** : 356
43.	—	*Lucilia caesar*, L.	France	—	71 : **22** : 120 ‡
		ANTHOMYIDAE.			
44.	—	*Mydaea allotalla*, Mg.	,,	—	,,
45.	—	,, sp.	Sweden	—	62 : **14** : 48 ‡
46.	♀	* sp. indet.	Bexley, Kent	11.vi.27	30 : **19** : 23
47.	♀	* Family indet.	Tubney, Berks.	10.vi.06	47 : **16** : 356

Asilid sp. indet.

		TRICHOPTERA.			
		LEPTOCERIDAE.			
1.	—	**Mystacides azurea*, L., ♀	Brockenhurst, New Forest	30.vii.07	47

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List of Observers.

In order to avoid duplication, and the possibility of confusion, a single series of consecutive numbers is used for the lists of publications and observers.

28—Adams, F. C.; 29—Andrewes, H. L.; 30—Andrews, H. W.; 31—Arnold, G.; 32—Bignall, G. C.; 33—Bristowe, W. S.; 34—Bradley, R. C.; 35—Chapman, T. A.; 36—Chitty, A. J.; 37—Clutterbeck, C. G.; 38—Cockayne, E. A.; 39—Collins, J.; 40—Collin, J. E.; 41—Donisthorpe, H.; 42—Edelsten, H. M.; 43—Fahringer, J.; 44—Forsslund,—; 45—Girschner, E.; 46—Goffe, E. R.; 47—Hamm, A. H.; 48—von Heydon, G.; 49—Hobby, B. M.; 50—Jansson, A.; 51—Jaennicke, F.; 52—Jordan, K.; 53—Killington, F. J.; 54—Kirby, W. & Spence, W.; 55—Kirkpatrick, T. W.; 56—Labouchere, F. A.; 57—Le Cerf, F.; 58—Longstaff, G. B.; 59—Lucas, W. J.; 60—Lundbeck, W.; 61—Lundblad, O.; 62—Melin, D.; 63—Morley, C.; 64—Newstead, R.; 65—Portevin, —; 66—Poulton, E. B.; 67—Richards, O. W.; 68—Ringdahl, O.; 69—Ringselle,—; 70—Rothschild, N. C.; 71—Séguy, E.; 72—Saunders, H. A.; 73—Saunders, L. D.; 74—Saunt, J. W.; 75—Smith, F.; 76—Verrall, G. H.; 77—Whitfield, F. G. S.; 78—Woodforde, F. C.; 79—Xambeu, V.; 80—Yerbury, J. W.; 81—Zeller, P. C.

BRITISH TABANIDAE (DIPTERA)

WITH AN ACCOUNT OF THE PRINCIPAL VARIATION.

With descriptions of a number of NEW FORMS, and of some ADDITIONS to the BRITISH LIST.

By E. RIVENHALL GOFFE.

The Tabanidae is one of the best-known families of Diptera amongst non-dipterists, for the blood-seeking habits of the females have the effect of forcing the attention of entomologists and others in a way that is most certainly not appreciated by those who desire to give their attention in other directions. It is impossible to ignore the ominous angry-sounding "buzz" of one of the larger species no matter how taken up one may be with something else, and it is still more disquietening when by the sudden cessation of the "buzz" one realises that it has settled *somewhere.*

The Tabanidae, particularly the Tabaninae, are amongst the easiest of the families of Diptera to recognise at sight. They are robust medium- to large-sized flies, with thorax almost rectangular, with large semiglobular head as wide as, or wider than, the thorax and with somewhat concave hind-margin, and with a characteristic wing venation (Plate I. Fig. 1). They have a general appearance which is unmistakable, and this, combined with their noisy flight and the blood-seeking habits of the females, enables the beginner to pick them out after very little experience.

Scientifically the family Tabanidae (according to Lindner's classification) is the third in the second section (Brachycera) of the first sub-order (Orthorrhapha) of the order Diptera, and consists of those species which possess the following characters :—

Antennae clearly 3-jointed (Plate I., Figs. 3 and 4), approximated at the base, the third joint annulated towards the tip and frequently bearing a dorsal hump or swelling soon after the base.

Palpi 2-jointed, the end joint porrect and thickened in the males, pendulous and elongated in the females.

Wings with veins Cu_2 and 1A converging, or meeting on or just before the wing margin, so that the anal cell is closed or almost closed. Vein R_{4+5} forked widely so that R_4 reaches the wing margin before the wing tip, and R_5 after the wing tip. A discal cell present, more or less hexagonal, and at about the centre of the wing. Costal vein continued right round the wing margin.

Legs with the front coxae unusually long so that the front legs seem very much longer than the middle legs. Feet with 3 almost equal pad-like pulvilli.

Squamae large and distinct.

Head large and hemispherical, back of the head slightly concave and fitting close to the thorax.

The species of Tabanidae are peculiar in that it is frequently easier to see the differences between species than it is to separate them by scientific descriptions, and the writer feels that the identification tables which follow are open to criticism on this account.

The sexes are easily distinguished by the eyes, which are usually touching in the males (exception *Chrysops rufipes*, non-British), well separated in the females. The palpi are also different in the two sexes as already noted, and the abdomen in the male is usually much more pointed than in the female, though not in the genera *Chrysozona* Meig., and *Chrysops* Meig.

Occasionally, however, one takes females with a more pointed abdomen like a male. All such that have come my way have been either absolutely fresh specimens just hatched, or have been odd examples taken out of season. Personally, I am inclined to the view that these females are those which have not paired, but the point needs investigation.

I can trace no record of gynandromorphism in Tabanidae; in the Tabaninae and Chrysozoninae this would be very difficult to detect, but in the genus *Chrysops* where the wings show obvious sexual dimorphism it could be seen at once. The point is one which is deserving of attention.

The abdominal markings of Tabanidae are noted by Surcouf (Tabanides de France) as tending to become darker in the same species as northern latitudes or high altitudes are reached.

Although the Tabanidae are a large family well spread over the world, the number of British species is not large. Verrall's List of 1901 enumerated 21 species, one (*Tabanus graecus* Fabr.) shewn as doubtful. This species was dropped from his British list in 1909 when Mr. Verrall produced Vol. V. of his work on the British Flies; thus 20 species as recognised to-day were then known. In "British Flies" Vol. V., 1909, Mr. Verrall listed 25 species, including *Tabanus glaucus* Meig., since sunk as a variety of *Tabanus bromius* Linn. after inspecting Meigen's type, making therefore 24 nett. In the present paper 27 species are listed.

The family includes the largest Palaearctic fly known, viz., *Tabanus sudeticus* Zeller, a species found in Britain.

Dr. G. Enderlein's new Classification.

The family has recently (1923-25) been revised by Dr. G. Enderlein (Mitteilungen aus dem Zoolog. Museum in Berlin, XI, Heft 2, pp. 255-409, and subsequent corrections) who has proposed a new

system of classification with new generic names. The effect of his proposals, *as far as only the British species are concerned*, is to erect three new genera as follows :—

(i) *Sziladynus* Enderl., to which he refers all the British species hitherto referred to *Therioplectes* Zeller.

(ii) *Dasystypia* Enderl., to which he refers the British species hitherto referred to *Atylotus* Ost. Sack. (*sensu lato*) and latterly to *Ochrops* Szilady, except *Atylotus plebejus* Fall.

(iii) *Straba* Enderl., to which he refers those species hitherto referred to *Tabanus* Linn., whose males have enlarged upper eye facets ; *i.e.* all the British species of **Tabanus* Linn. (*sensu* Verrall), except *T. bovinus* Linn.

The above generic names will be dealt with in their respective positions later in this Paper.

Habits.

Tabanidae are most abundant in marshy districts, or near small streams, as most species spend their early stages in mud or water. A few, however, are never found far from salt-water marshes, and at least one species (*Tabanus glaucopis* Meig.) seems to be confined to high down-land with wooded slopes ; whether it breeds in dew ponds or in the soft moist earth of the woods and forests has not been definitely ascertained. Some species are ubiquitous and seem to occur in every possible place ; others are exceedingly local and seem confined to a restricted area.

Being strong fliers Tabanidae are apt to wander far, and specimens are occasionally seen many miles from water or marsh. They are particularly fond of flying to the tops of hills or mountains and of congregating in swarms at the highest point. More than one writer has stated that copulation takes place in such situations in the early morning.

Tabanidae have none too long a season compared with most other families of Diptera, for whilst they may be seen from May to September their real season is from June to August.

The capture of males is not so easy as the taking of females ; they appear to spend much of their time in lofty flight or resting on tree tops, and are distinctly rare in collections. They are occasionally found resting on posts, palings, tree-trunks, etc., these being presumably freshly-emerged specimens drying their wings ; they are also taken on flowers, on shrubs near water, or resting on bracken, etc., or drinking from mud pools or small sluggish streams

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* In the actual paper quoted above Enderlein takes *our* species of *Tabanus*, other than *bovinus* and *sudeticus*, to be hairy eyed ; and so places them in *Atylotus*. Microscopical hairs can be detected in these species but they are not *obviously* hairy.

to which they descend in very hot weather. It is by no means easy to take such wary insects off mud; even when one can get within reach without sinking too deeply it is still not easy to avoid netting the mud as well. It is still more difficult, however, to secure specimens that have descended to drink at pools or streams, as they sail down from the tree-tops, dip once or more in rapid succession like a skimming stone thrown by a boy, and then return aloft once more. One has to be standing in just the right place, have a good foot-hold (not always easy in such places), and be very quick with one's net. A very interesting note on the drinking habits of male Tabanidae by H. P. Jones appeared in The Entomologist 1922, pp. 40-42, and should be read by all interested in this group. It may be as well to mention here that Mr. Jones's *Th. solstitialis* was almost certainly *Th. distinguendus* Verr., and his *T. bovinus* largely or entirely one of the forms of *T. sudeticus* Zell.

Male Tabanidae have also been noted as being prone to hover quite early in the morning, particularly on hills and mountains. Mr. T. W. Kirkpatrick in Entom. Mo. Mag. 1918, p. 18, records that males of *Th. distinguendus* Verr., were observed in abundance hovering near the top of Leith Hill, Surrey, between 6.30 a.m. and 10.0 a.m., and I myself have observed males of *C. pluvialis* Linn., hovering in mid-morning sunshine over Meadow Sweet (*Spiraea ulmaria*) in my garden at King's Somborne, Hants.

The females of Tabanidae are persistent blood-suckers of both man and animals. Usually they circle a number of times round their intended victim before settling, making a buzzing sound which is deeper toned with the larger species than with the smaller. I have noticed that species of different genera usually (though not invariably) select different parts of the victim's anatomy for settling. Species of *Tabanus* and *Atylotus* seem to prefer the legs either just above or just below the knees; species of *Therioplectes* make for the crutch of the legs; species of *Chrysozona* prefer one's wrists; whilst *Chrysops* species attack the back of one's neck.

The ease with which such large and apparently heavy-bodied species can alight unnoticed even on one's skin is bound to arouse the admiration of the victim! Presumably the elongated front coxae enable the insect to make contact with the front tarsi in some unusual way; certain it is that the front tarsi serve some special purpose. The small "touch hairs" with which they are furnished have been noticed by numbers of observers, and Lundbeck (Diptera Danica, Vol. I., p. 86) noted that species of Tabanidae held between the fingers used their front legs in a palpitating manner as if sensing something with them. Usually the first one learns of the unnoticed visitor is the pin-prick felt when she pierces the skin.

Mounting.

Tabanidae should be set with the wings extended at right angles to the thorax and abdomen. This exposes the sides of the first few abdominal segments, whose markings are frequently of importance. The legs should also be drawn out to full extent—the two anterior pairs forwards and the posterior pair backwards—the hairs on the several leg parts are then easily seen.

In labelling Tabanidae it is essential that the data include a note of the colour of the eyes in life, whether or not the eyes have colour bands, and if so how many. These colour bands are an essential item in naming specimens, but unfortunately they disappear a few days after death. They can sometimes be brought back by ralaxing, but it would not be safe to put a specimen down as " eyes unbanded " because relaxing failed to bring back any bands.

DIVISION INTO SUB-FAMILIES.

The British species of Tabanidae fall into three sub-Families :—

1\. Hind tibiae with 2 small spurs at the tarsal end (Plate I. Fig. 7) . . . . . . *SILVIINAE.*

— Hind tibiae without spurs. . . . . 2.

2\. Third antennal segment with three rings at the tip (Plate I. Fig. 4) . . . . *CHRYSOZONINAE.*

— Third antennal segment with four rings at the tip (Plate I. Fig. 3.) . . . . *TABANINAE.*

I. SUB-FAMILY SILVIINAE.

One genus only has been found in Britain :—

GENUS CHRYSOPS Meigen, 1800.

Chrysops Meigen, Nouv. Classif., p. 23, 1800.
Chrysops Meigen, Illig. Mag. II. p. 267, 1803.
Heterochrysops Kroeber, Zool. Jhrb., Vol. XLIII, p. 50, 1920.
Neochrysops Szilady, Ann. Mus. Nat. Hung., XIX, p. 126, 1922.

Genotype *Chrysops caecutiens* Linn.

The four British species referable to this genus are medium-sized to rather small flies, mostly blackish with yellow abdominal markings, especially on the first two abdominal segments. One species, however, is entirely blackish in both sexes. The eyes are vivid green in life with purplish spots and are very handsome. The wings bear conspicuous blackish-brown markings, a little more extensive in the males than in the females, which comprise a broad transverse band across the middle of the wing, an apical blotch, and a long

basal blotch on the upper margin of the wing. Frontal band between the eyes in the female bearing rather large and shining black callosities (Plate I. Fig. 8) with three distinct ocelli at the vertex. The eye-facets are enlarged in the upper two-thirds of each eye in the males of all four species.

Typical specimens of the four species are easily distinguished at sight by the abdominal markings. These are, however, subject to considerable variation, so that other more reliable characters have to be employed.

TABLE OF SPECIES OF GENUS *CHRYSOPS* MEIG.

Eyes separated = *Females, vide TABLE A.
Eyes touching = Males, vide TABLE B.

TABLE A. (FEMALES).

1. Black species, abdomen black with tawny pubescence on hind margins of abdominal segments. Outer margin of the blackish transverse mid-wing band from vein R_{4+5} to lower wing margin more or less *concave* (Plate I. Fig. 6). . . . . . *sepulcralis* Fabr.

— Species with first and second abdominal segments predominantly yellow, with black †markings in centre. Outer margin of blackish mid-wing crossband more or less *convex* (Plate I. Fig. 5). 2.

2. Middle tibiae black, paler at the base; legs black, except middle and hind tarsi which are partly reddish; first and second abdominal segments usually bearing a central black band enclosing a more or less triangular yellow spot standing on the lower margin of the second segment (Plate I., Fig. 9), thus the second segment appears to bear an inverted black V. . . . . *caecutiens* Linn.

— Middle tibiae yellowish-brown, blackish at apex. . . . . . 3.

3. Second abdominal segment orange yellow bearing a single black spot, frequently isolated and of small size, but varying from a mere spot, or nothing at all, to a more or less rectangular or quadrate blotch continuous with the central black area of the first segment (Plate I., Fig. 10). . . . . *quadratus* Meig.

   NOTE. Specimens with but a mere black spot, or nothing at all, on abdominal segment 2 may be varieties of *C. caecutiens* with the inverted black V undeveloped. The legs and middle tibiae should be carefully examined.

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*Eyes not touching in the males of *C. rufipes* Meig., a species that has not yet been recorded from Britain.

†NOTE. The black markings on abdominal segment 2 may be reduced to a spot, or may even be entirely obsolete. See under variation.

— Second abdominal segment yellow, bearing two black lobes inclined downwards and outwards, usually united at their bases (Plate I., Fig. 11). . . . . *relictus* Meig.

TABLE B. (MALES).

1. Outer margin of blackish transverse mid-wing crossband between vein R_{4+5} and lower margin of wing more or less *concave*. . . . . *sepulcralis* Fabr.
— Outer margin of blackish transverse mid-wing crossband more or less *convex*. . . . . 2.
2. Middle tibiae blackish, more or less brownish at the base. Abdomen almost entirely black with orange spots just showing on the sides of the first and second segments when viewed from above. . . . . *caecutiens* Linn.
   NOTE. Occasionally the orange side-spots are more conspicuous and extended. See under variation.
— Middle tibiae brownish yellow; species with considerable yellow on first and second abdominal segments, though not so much as in the females. . . . . 3.
3. Black blotch on second abdominal segment more or less quadrangular. . . . . *quadratus* Meig.
— Black blotch on second abdominal segment deeply notched below, thus appearing double. . . . . *relictus* Meig.

Chrysops caecutiens Linn.

C. caecutiens Linn., Fauna Suecica, p. 464, 1761.
C. lugubris Linn., Fauna Suecica, p. 464, 1761.
C. maritimus Scop., Entom. Carniol., p. 374, 1763.
C. nubilosus Harr., Expos. Engl. Ins., p. 28, 1780-2.
C. viduatus Fabr., Syst. Entom., Vol. 4, p. 374, 1794.
C. crudelis Wied., Auss. zweiflg. Ins., Vol. 1, p. 195, 1828.

Undoubtedly the commonest species of the genus and found in almost all marshy places in the South of England; becoming less common northwards, but extending to the north of Scotland. It is on the wing from the beginning of June to the end of August, with occasional specimens before and after those dates.

Male.—Dark coloured, generally resembling *C. sepulcralis*, but distinguished at once by the convex outer margin to the dark mid-wing band. Abdominal segments 1 and 2 have orange-yellow side spots, most distinct on segment 2. These are not very conspicuous when viewed from above, but when viewed sideways are seen to pass over the sides of the abdomen and to merge with similar spots on the underside. Average length 9mm.

Female.—Generally a little larger than the male and more brightly coloured. Abdomen with first two segments predominantly

golden-yellow with a blackish central area across segment 1 passing on to an inverted V or hollow black triangle on segment 2. Third and subsequent segments black with some golden pubescence, and with a small yellowish triangle (not always distinct especially if the specimen be rubbed) on segment 3. Average length 11mm. (Plate I., Figs. 5, 7, 8, 9).

VARIATION.

This species is subject to considerable and most interesting variation, which up to the present has received but scant attention, so that the distribution of the various forms is very imperfectly known. There are few published references to varieties of *Chrysops* species, and most of the common forms have neither been described nor named. In the following notes I have attempted to classify the more important variation as far as published records and the collections I have been able to examine will allow. In the absence of further records from a wider area it is useless to attempt to localise the several forms, or to suggest causes for their appearance. With more observers and an abundance of material from a wide area the blanks in our knowledge would rapidly fill up.

I would more than welcome correspondence with any entomologists who will take considerable series of this and the following species in 1931 and subsequent years, and who will be so kind as to communicate their results to me.

FEMALE VARIATION.

The principal female variation lies in :—

(a) Increase in, or reduction of, the black markings on abdominal segments 1 and 2.

(b) The colour of the first (basal) antennal segment.

The black markings on the abdominal segments, particularly on segment 2, vary considerably. In one direction they tend to increase in amount and intensity so as partly or wholly to obliterate the small yellowish triangle enclosed by the black inverted V on segment 2, and to encroach on the remaining yellowish orange area of the first two segments. In the other direction the black markings diminish and the inverted V is partly or wholly undeveloped. The marking on segment 2 thus becomes reduced to a point or streak, and in the extreme case vanishes altogether, leaving segment 2 all orange-yellow.

The limited material that I have been able to examine suggests that the forms with intensified black markings are most often produced in the west, whilst those with reduced markings are usually found in the east and south-east, particularly Essex. Only further observation over a wide area can confirm or refute this, however, and

both extremes seem to be represented in the New Forest specimens.

The following six forms represent successive stages in the range of variation above described, and with a little latitude every specimen taken can be referred to one or another of them.

caecutiens **niger,** form. nov. ♀. This is the strongly suffused form in which the enclosed small yellowish triangular spot on abdominal segment 2 is completely obliterated by the black, which also encroaches more or less considerably on the remaining yellowish orange area of segments 1 and 2. There are two specimens in the British Museum collection that I should refer to this form though neither have *absolutely* no trace of the yellow spot. One labelled " Lyndhurst, June 25th, 1894, Col. Yerbury " shows just the faintest indication of where the spot should be (under a lens), and the other, labelled " Rugby, July 10th, 1892," runs it very close. It has been suggested to me that the " black variety " of *C. caecutiens* recorded by Duncan in 1838 from Sutherlandshire may have been this form, but most dipterists consider it to have been *C. sepulcralis*, a species not then recognised as British.

caecutiens **nigrescens,** form. nov. ♀. The sides of the inverted black V on abdominal segment 2 are dark and heavy, and the small yellowish triangle thereby enclosed is somewhat reduced in size. From the feet of the sides of the inverted black **V** are black extensions outwards along the lower margin of segment 2 which more or less reach the sides of the abdomen, but do not go over the sides. Basal segment of antennae blackish.

Occurs commonly with the type in the New Forest, Hants., and in numerous other localities.

caecutiens **caecutiens** Linn. ♀. The black inverted V on abdominal segment 2 complete, but the sides not thickened, and the latter end abruptly on the lower margin of the segment without any extensions outward as in *nigrescens* (Plate I, Fig. 9). First antennal segment with basal part brownish red, or all blackish.

This is typical *caecutiens* Linn., as I understand it, and is the prevailing form in all South of England localities in which I have collected, and in all collections that I have been enabled to examine.

caecutiens **obsolescens,** form. nov. ♀. The black inverted V not complete, but partially wanting. In some specimens the pattern of the whole V is indistinctly and faintly suggested ; in others it is clearly marked for a short distance and the remainder is completely wanting. First antennal segment all brownish red.

Not rare, but decidedly uncommon. I have taken this form at Linwood, New Forest ; also at Tickenham, Somerset. Mr. H. J. Falkner kindly sent me 2 specimens taken on Galleywood Common, Chelmsford, by G. P. Hope. Mr. B. S. Harwood has taken it near Colchester. Verrall (British Flies, Vol. V., p. 428) records a specimen taken at Lyndhurst, 22.6.1872. Mr. C. J. Wainwright has one from Lyndhurst, taken 17.7.1894. Mr. J. W. Saunt has 1 specimen from Bubbenhall, Warwks., 21.7.1919.

caecutiens **meridionalis** Strobl. (1906, Mem. Real Soc. Esp. Hist. Nat., III., p. 277) ♀. The inverted black V on second abdominal segment quite undeveloped, just a black spot or dash remaining on the upper margin of the segment. First antennal segment brownish red as in *obsolescens*. Traces of yellow side spots on abdominal segments 3 and 4, and sometimes of a pair of symmetrically placed small reddish spots on segment 3.

Rare. One specimen taken by Mr. B. S. Harwood near Colchester in 1907.

caecutiens **obsoletus**, form. nov. ♀. No trace whatever of black markings on abdominal segment 2, which is thus clear golden yellow.

Mr. C. J. Wainwright has one specimen of this extreme form from Switzerland. I have not yet seen a British specimen with *absolutely* no trace of black on segment 2, but Mr. B. S. Harwood's specimen of *meridionalis* bears such a small faint speck there that it only just fails to qualify.

N.B.—The last 3 forms could easily be mistaken for similar forms of *Chrysops quadratus*, Meig., and the colour of the legs, and especially of the middle tibiae, must be carefully noted.

MALE VARIATION.

Variation in the male consists of an increase in the amount and brightness of the orange side spots on abdominal segments 1 and 2, with a tendency to extend to segment 3.

caecutiens **fulvus**, form. nov. ♂. First and second abdominal segments with bright golden yellow side spots which are clearly visible from above and pass over the sides (as in typical *caecutiens*) to merge with similar spots on the underside; the latter separated by a broad dark middle band. A trace of yellow spots on the sides of the third segment also; wing pattern normal, undivided by a hyaline band on basal half.

Mr. H. J. Falkner sent me a beautiful specimen of this male form labelled "New Forest, 20 Aug., 1921, H. Audcent"; and Dr. F. H. Haines has several specimens from localities in South Dorset between Wareham and Dorchester. There is a specimen in the British Museum collection labelled "Lyndhurst, 12 July, 1874, Col. Yerbury," and the male from Wyre Forest referred to by Verrall in "British Flies, V., p. 428," appears to be this form.

VARIATION COMMON TO BOTH SEXES.

This consists in one direction in the dark markings on the wings becoming inky black and sharply defined; and in the other direction in a tendency for them to become a paler chocolate tint not so sharply defined, and with hyaline patches developing in the dark patches, particularly in the discal cell.

caecutiens **clarus**, form. nov. Dark markings on the wings inky

black in place of the usual blackish brown, and sharply defined. Verrall (British Flies V., p. 428) refers to a series taken at Porthcawl, South Wales, in July, 1906, which belong to this form. I have a female from Matley Bog, New Forest, 10th Sept., 1930, which nearly approaches it; Mr. H. W. Andrews has a similar specimen from Westerham, Kent, 28 June, 1930. Mr. J. W. Saunt took 2 ♀ at Croyde, Warwks., 19.7.1930.

caecutiens **hyalinatus,** form. nov. Dark markings of the wings pale chocolate brown, with hyaline kernels in the discal and/or other cells crossed by the broad mid-wing band, and in the wing tip. This form is not uncommon, and I have a particularly good female labelled "Eastleigh, 26 July, 1924, F. J. Killington."

caecutiens **trifenestratus** Kroeber (1920, Zool. Jahrb., XLIII., p. 119). Described by Kroeber as a male aberration, but Surcouf (Tabanides de France, p. 224) records a female which he refers to this form.

Male. Wings with a hyaline crossband between the broad dark mid-wing band and the dark basal area of the wing. Abdomen as in the form *fulvus* but with the yellow side spots on the second segment even more extended on the upper side.

Female (after Surcouf). Second abdominal segment as in typical *caecutiens*, but with the markings brown instead of black, third segment with yellow side-spots as in the male. First antennal segment all reddish brown, third segment yellowish at the base of the apical part. Middle femora clear brown. Wings with hyaline basal cross-band similar to the male.

I have not yet seen either sex from Britain, but it has been recorded from France and Germany, as well as from Spain and Sicily, and should, therefore, be found here if worked for.

Further variation occurs in the wing veins Cu_2 and 1A, which in normal *caecutiens* should just meet on the wing margin. In some specimens, however, they meet well before the margin; in others they do not meet at all, so that the anal cell is left "open."

This variation is interesting because the wing venation in Diptera is usually very regular in a given species, and this is one of the exceptions. This variation is apparently independent of the other forms of variation already noticed, and is not even always constant as between the two wings of the same individual.

Chrysops quadratus Meigen.

C. quadratus Meig., Syst. Beschr., II. p. 70, 5, 1820.
C. viduatus Meig., (p.p.), Klassif. und Beschr., I. p. 158, 1804.

This species has been known to most authors for well over 50 years under the name of *quadratus* Meig. Meigen treated the two sexes as distinct species, calling the male *quadratus* and the female

pictus. The latter actually came first in his book and, therefore, has page precedence. Recently certain Continental authors have revived the name *pictus* for the species, presumably on account of Article 27(c) of the International Rules of Zoological Nomenclature which states that the *oldest* name must be retained when the two sexes have been considered as distinct species. At first glance this appears to be correct, but on reading the next Article 28 it becomes clear that Article 27 is only intended to apply to cases where the two sexes were named *at different dates*. Article 28 in dealing with the union of two specific names as one species states clearly " if the names are of the same date that selected by the first reviser shall stand." Page precedence is referred to in the last of the 3 recommendations which follow, which reads "other things being equal that name is to be preferred which stands first in the publication (page precedence)."

This last is a recommendation only, not a rule.

The first reviser to publish the fact that *pictus* and *quadratus* were sexes of one and the same species, and to select one of the names as the specific name for the combined species, that I have been able to trace, was Schiner, who in " Fauna Austriaca, Diptera," 1862, described the species under the name *quadratus* Meigen, and clearly gave the male and female synonymy with full bibliographical references to Meigen's descriptions.

Unless an earlier and contrary revision can be cited, Schiner's selection must stand, and the name *quadratus* be retained. This is really very satisfactory, for whilst *quadratus* Meig. describes a form common to both sexes, *pictus* Meig. describes a form which has been found in the female sex only, and would, therefore, have made a most unsuitable name for the whole species.

Male. First abdominal segment black with orange yellow wedge-shaped side-spots ; second segment orange yellow with a large black central quadrate spot on the upper margin reaching down half the width of the segment ; remaining segments yellowish with large sinuous black spots on the upper margins. The lower margins of all the segments except the first are thus left yellow. Antennae black. Femora black. Tibiae brown. Underside of abdomen yellowish with bright middle band. General appearance blackish with considerably more yellow than in the male of *C. caecutiens*, though not so yellow as in the females.

Female. First abdominal segment black with yellow wedge-shaped side spots ; second segment yellow with a central black spot varying from a quadrate shape almost as big as in the male down to a mere spot or dash, or in extreme cases wanting altogether. (Plate I., Fig. 10.) Third segment with a broad black spot based on the upper margin indented in the centre of its underside, lower half of segment yellowish ; remaining segments similar, but the yellow less distinct. Underside yellow, with black rectangular spot

on the third segment the remainder black with yellow pubescence. Antennae black, reddish at the base. Femora black, the middle femora brownish at the apex. Tibiae brown, the middle tibiae brighter.

Length 7-11mm.

The species is not so common as *C. caecutiens* particularly in the north, but is widely spread in the southern and Midland Counties. It is very common in the New Forest, particularly in the district surrounding Matley Passage and Denny Lodge.

VARIATION.

The species varies much in size; on an average it seems to be a smaller species than *C. caecutiens*, but I have several females of the *quadratus* form which are as big as the biggest *C. caecutiens* I possess. Szilady, in 1917, described a form *minor* from Spain whose length was only 6½mm., but Kroeber (Lindner, Die Fliegen de pal. reg., Tabanidae, p. 15, 1925) gives *minor* Szil. specific rank. The species exhibits the same variation in the meeting of the wing veins Cu_2 and 1A as does *C. caecutiens*.

FEMALE VARIATION.

As in *C. caecutiens* the principal variation lies in the second abdominal segment marking, which varies from a more or less rectangular quadrate spot to nothing at all. The following five forms represent successive stages in this range of variation, and with a little latitude every specimen taken can be referred to one or another of them.

quadratus **quadratus** Meigen (1820, Syst. Beschr., II., p. 70, 5). Second abdominal segment bearing a central rectangular quadrate black spot based on the upper margin of the segment and reaching about half way down same. Immediately below this spot can be faintly distinguished a yellow triangular spot very slightly paler than the golden yellow of the rest of the segment, which appears to be of a deeper tint than in the other forms. Most of the large specimens appear to belong to this form. Common in the New Forest, and no doubt found elsewhere in the south though Verrall would not appear to have seen it, as he merely states " . . small black spot varying a little in shape," and illustrates the form *pictus*.

quadratus **intermedius**, form. nov. ♀. The black spot on the second abdominal segment smaller, but reaching a little down each side of the apex of the faint yellow triangle referred to in the previous paragraph. The spot thus looks something like a circumflex accent. (Plate I. Fig. 10). Occurs commonly with the type in the New Forest.

quadratus **pictus** Meig. (1820, Syst. Beschr., II. p. 70, 4). The

black spot on second abdominal segment further reduced to a small triangle. Occurs commonly in the New Forest, and appears to be the prevailing form both in Britain and in France.

quadratus **lineatus,** form. nov. ♀. The black spot on the second abdominal segment reduced to a mere speck or dash. Rather uncommon. I have specimens from Matley Bog, New Forest, Hants; and Mr. C. J. Wainwright has also a number of New Forest examples. Surcouf (Tabanides de France, p. 226) implies that it is not so uncommon in France.

quadratus **obsoletus,** form. nov. ♀. The central black spot on abdominal segment 2 entirely wanting. I have not yet seen a British specimen, but Mr. C. J. Wainwright has one from Italy, and Zetterstedt (Dipt. Scand., VIII. p. 2945) refers to 2 similar specimens, apparently from France. Surcouf (Tabanides de France, p. 226) writes "la tache du second (tergite) est rudimentaire ou *nulle*, rarement developpée."

Male Variation.

I have not seen any published records of varieties in the male, nor have I seen any variation of note in the rather limited number of males that I have been able to inspect. It is rather remarkable that the form *pictus* does not seem to occur in the male sex, and it would be most interesting to examine a long series when it could be seen to what extent the second abdominal segment markings tended to vary.

Chrysops relictus Meigen.

C. relictus Meig., Syst. Beschr., II. p. 69, 1820.
C. caecutiens Panz. *nec* Linn., Fauna Germanica, pp. 13-14, 1794.
C. viduatus Meig. (p.p.), Klassif. und Beschr., I. p. 150. 1804.

Male. More yellowish than the males of the previous two species, though clearly darker than the females. The yellow colouring is more orange in the male than in the female.

Abdomen: first segment black with yellow side spots, smaller than in the female; remaining segments yellowish with a large central black marking based on the upper margin of each segment, not quite reaching to the lower margin and deeply notched centrally by a small yellow triangle. These small yellow triangles thus form a median band.

Female. Bearing a general resemblance to the male, but yellower and the yellow colour paler. The yellow side spots on the first abdominal segment are longer, and the second segment is yellow with two black lobes inclining downwards and outwards, and usually united at their bases. (Plate I. Fig. 11.) The remaining segments are similar to those of the male. The median yellow triangles are much more distinct in this species than in *quadratus*. The wing

markings are on the average considerably paler than are those of the two preceding species and the wing cells covered by the wing-bands all have more or less hyaline kernals.

Mr. Verrall stated that *Chrysops relictus* was quite common, but I have found it distinctly uncommon, and most of my correspondents in the Southern Counties have had the same experience. I notice, however, that F. B. Jennings (E.M.M., 1897, p. 258) found *relictus* the commonest species in the Lea Valley, near London ; and H. W. Andrews has taken it freely in the Thames Marshes. It gives me the impression of being most often found around watery places on old heathlands, at any rate this is the case in Hampshire and Dorsetshire. In Hampshire it has been taken sparingly at Lyndhurst (Col. Yerbury) ; Brockenhurst (W. R. O. Grant and H. P. Jones) ; Hengistbury Head (F. J. Killington) ; Fordingbridge (H. W. Andrews). In Dorset : on Wareham and other Heaths (Miss E. K. Pearce and others) near Studland B. S. Harwood) near Arne (Dr. F. H. Haines). It seems to occur in most counties from the south coast up to Scotland, being stated to be more common there than *C. caecutiens*.

Variation.

The variation in this species appears to run on quite different lines from that of the two species just described. The black markings in the female on abdominal segment 2 are in this species remarkably constant. The amount of material that I have been able to examine, however, has been more limited than I would have wished, and it is possible that long series from widely differing localities may show it to be otherwise. I have seen but two varieties of the black markings of abdominal segment 2 worthy of note, and in each case they have been single specimens only :—

var. 1 has the black lobes reaching to the lower margin of the second abdominal segment thus completing a triangle something like *C. caecutiens*. The specimen was taken by Mr. H. W. Andrews at Kenmare, Co. Kerry, 26.7.1908, and also has the yellow median triangles on the 2nd to 5th abdominal segments much enlarged.

var. 2 is an old specimen in poor condition, probably from South Devon, but without data. In it the black lobes are not united at their bases and are more vertical. The cleavage extends to the central black spot on the first abdominal segment, which is thus divided in its middle. The specimen has a rather different look from *C. relictus*, but Mr. J. E. Collin (who was good enough to examine it for me) considers it to be but a variety of this species. If more specimens in better condition could be secured it would be possible to give a more considered opinion.

Female Variation.

The principal female variation in *C. relictus* lies in the pale

yellow median triangles on abdominal segments 2-5 which vary in size from being considerably enlarged to being almost obsolete, and in colour from pale yellow to a slaty green. The following four forms cover the extent of this variation :—

relictus **inconspicuus,** form. nov. ♀. The yellow median triangle on abdominal segment 3 indistinctly indicated, and a faintly yellow lower margin to the segment. The remaining segments 4 and onward entirely black without trace of median triangles, and with very slight yellow pubescence. Apparently rare. Mr. H. W. Andrews has a fine example of this form from Hunstanton, Norfolk, taken July 18th, 1901.

relictus **relictus** Meigen (1820). Median yellow triangles clearly indicated on abdominal segments 3 and 4, and faintly on segment 5. Lower margins of segments clearly yellow. Median triangles of medium size, with top angles not quite reaching the upper margins of the segments. The prevailing form in all collections that I have examined.

relictus **chlorosis,** form. nov. ♀. The median triangles, including that on segment 2 between the black lobes, and all the pale markings on the remaining segments 3 and onward, of a slaty green colour in place of the normal pale yellow ; the specimens are otherwise normal. Probably local, but not uncommon where found. Mr. H. W. Andrews has a short series of this form from Southern Ireland, and Mr. B. S. Harwood has one taken at Sudbury, Suffolk, in 1929.

relictus **conspicuus,** form. nov. ♀. Median pale yellow triangles clearly formed on abdominal segments 2 to 5, and the triangles much enlarged both sideways and upwards so that the top angles appear cut off by the lower margin of the segment above. Mr. H. W. Andrews has a very fine example of this form from Kenmare, So. Ireland, July 26, 1908.

Male Variation.

I have not been able to observe any obvious variation confined to the male sex.

Variation Common to Both Sexes.

relictus **clarus,** form. nov. Wing markings very dark, almost black, in place of the normal pale chocolate brown. In the only male I have seen of this form (taken by Mr. H. W. Andrews on the Thames Marshes in July, 1901) the specimen was unusually large, and the abdominal orange colouring somewhat suffused, giving it an appearance more like *C. quadratus.*

Mr. F. J. Killington found *C. relictus* on 31 Aug., 1930, in a new locality for Hampshire on Hengistbury Head, and the specimens taken all belonged to this form. The specimen from Tangham Forest, Woodbridge, Suffolk, 26 Aug., 1907, described by Verrall in "British Flies" V., p. 435, apparently belongs to this form also.

Apparently uncommon, but probably more local than rare. The late date of these captures suggests that it may be a late season form, but further investigation is required.

Chrysops sepulcralis Fabricius.

C. sepulcralis Fabr., 1794, Entom. Systematica, IV., p. 374.

Abdomen dull black in both sexes, the female with distinct yellow pubescence.

Male. Eyes touching for a short distance only, in life brilliant greenish-blue with 3 purple spots and a faint streak. Eye facets enlarged in the upper two-thirds but not sharply contrasted. Antennae dull black, the third joint brownish. Thorax and scutellum black, not very shining, and (in my specimens) without any distinct yellow pubescence on the sides. Abdomen black, not shining, without yellow side spots to segments 1 and 2.

Female. Eyes in life brilliant greenish-blue with 3 purple spots, a faint streak, and a copper sheen. Thorax and scutellum black, more shining than in the male, and with a distinct and conspicuous tuft of golden pubescence on the sides. Abdomen moderately shining, black, with yellowish pubescence on the lower margins of the segments.

The male superficially resembles that of *C. caecutiens*, but is easily distinguished by the absence of yellow abdominal side spots, and by the different wing markings with a concave outer margin to the transverse midwing band.

Kroeber (Lindner "Die Fliegen der Pal. Reg., Tabanidae, p. 20"), describes the male as having golden yellow pubescence on the sides of the thorax; and he uses this character to distinguish *C. sepulcralis* from *C. maurus* Siebke. I have noted above that my specimens (from Hengistbury Head, Hants) do not possess this, and I notice that Surcouf (Tabanides de France, p. 219) makes the same comment. I find also that the figure of the male wing in Kroeber's Plate A, fig. 6, differs from my specimens, which have a much more extensive hyaline space at about the middle of the wing.

C. sepulcralis is a very local species, and is found in marshy places beside small ponds on old heathlands from July to September. Such places are to be found in South and East Dorset and in the adjacent parts of Hampshire, in the Scottish Highlands, and no doubt in many intermediate situations.

The capture of the species on Hengistbury Head has added it to the County List for Hampshire, Mr. J. E. Collin's capture on Parley Heath (most of which is in Dorset) being recorded by Verrall as from Dorset.

VARIATION.

I have been able to observe little or no variation in this species, other than the variation from Kroeber's description and figure noted above. It is, of course, quite possible that Kroeber's specimens and ours are not con-specific, but I have not been able to compare good series of English and Scotch specimens with Continental ones. Verrall (British Flies, V, p. 438) points out that a short series from Aberfoyle, Perthshire, are rather distinct, being larger and with a more ovate abdomen with longer and more conspicuous pubescence. The specimens were all females.

OTHER CHRYSOPS SPECIES LIKELY TO OCCUR IN BRITAIN.

The following three species may be found in Britain, and a sharp look-out should be kept for them.

C. rufipes Meig. A dark-coloured species which, in the female, has all the femora reddish-yellow, and rather distinct and characteristic facial callosities. The male is black and has the eyes *not* touching though aproximated. The outer margin to the dark mid-wing band is convex in both sexes.

C. parallelogrammus Zeller. Has the outer margin to the dark mid-wing cross band concave; otherwise it resembles *C. relictus*, but has more orange on abdominal segment 3.

C. maurus Siebke. Surcouf (Tabanides de France, p. 219) gives "Angleterre" as a locality for this species, but I have been unable to trace his authority for the record. It resembles *C. sepulcralis* but the male has the thorax shining with a blue reflection, and also a hyaline spot at the apex of the basal cells R and M of the wings. The female is without the golden yellow pubescence on the sides of the thorax. If British it would presumably be a North Scotch species.

II. SUB-FAMILY CHRYSOZONINAE.

One genus only has been found in Britain, though *Heptatoma pellucens* Fabr. has occurred in Denmark, and may, therefore, be found in these islands.

GENUS CHRYSOZONA Meigen, 1800.

Chrysozona Meig., Nouv. Classif., p. 23, 1800.
Haematopota Meig., Illiger's Mag., II, p. 267, 1803.

Genotype *Chrysozona pluvialis* Linn.

Although the generic name *Chrysozona* had three years priority the species referred to this genus had until recently been referred to Meigen's second name *Haematopota*, partly because Meigen himself

used this name, and more especially because the "Nouvelle Classification" of 1800 was considered to be little more than a list, without adequate generic descriptions.

As, however, Art. 32 of the International Rules of Zool. Nomencl. clearly stated that a generic or specific name, once published, cannot be rejected even by its own author the matter was submitted to the Commission for an opinion.

This Opinion (No. 28) stated that Meigen's generic names in his "Nouvelle Classification" of 1800 must take precedence in every case where they are otherwise valid under the Code. A name is "otherwise valid" if it be the first published name for the genus and be not preoccupied in Zoology. We have, therefore, no option but to accept this decision and loyally abide by it. As the genus *Haematopota* was the type genus of the sub-family it is necessary to change the name of the latter from *Haematopotinae* to *Chrysozoninae* under Art. 5 of the International Rules.

The four British species referable to this genus are medium-sized to slightly smaller flies of a more or less uniform mouse-grey colour with indistinct whitish or lighter greyish markings on some or all of the abdominal segments. The wings are heavily marmorated, the markings shewing a certain constancy in the species which is sometimes a useful check in the identification of a doubtful specimen. The wing vein R_4 has a recurrent veinlet soon after its forking from R_5. Thorax with longitudinal stripes often very indistinct, the lateral ones frequently terminating abruptly in very small white spots.

The antennae, particularly the first or basal segment, are of considerable value in separating the species.

The eyes are touching in the males, separated in the females, and in the males the eye facets of the upper two-thirds of the eyes are enlarged, and the line of separation is rather sharply defined.

The females approach quietly, but they can be distinctly heard if one is listening for them. They prefer to settle on one's wrists, but on really hot days when Tabanidae are numerous they will settle anywhere. One species (*Chrysozona pluvialis* Linn.) flies in dull weather and quite late in the day, hence its specific name.

TABLE OF SPECIES OF GENUS *CHRYSOZONA* MEIG.

Eyes separated = Females, vide TABLE A.
Eyes touching = Males, vide TABLE B.

Table A. (Females.)

1. First antennal segment long and cylindrical, four or five times as long as wide, not wider than the third segment, usually not shining. Rather larger species, with wing markings appearing somewhat "washed out." . . . . *italica* Meig.

— First antennal segment shorter, two to two-and-a-half times as long as wide, more or less ovoid, and shining on at least the tip. 2

2. Third antennal segment completely blackish, rarely very slightly reddish at the base. First antennal segment short, very ovate, and shining black throughout. Wing markings distinctly darker than in the other species. Abdomen without pale dorsal line, and without spots on segments 1 to 3. . . . . *crassicornis* Wahlb.

— Third antennal segment more or less reddish on at least the basal half. First antennal segment not so short and ovate, usually with a constriction just before the tip and only the basal part shining. Wing markings not so dark as in *crassicornis*; abdomen with more or less distinct median dorsal band and side spots. . . . . 3.

3. Femora and coxae yellowish red. Abdominal markings very distinct and reaching even the first segment. Second and third antennal segments usually yellowish red. Wing markings somewhat pale and washed-out. . . . *bigoti* Gobert.

— Femora black or greyish. Abdominal markings not so clearly distinct and only reaching to the second or third segment. Wing markings not so pale and without a washed-out appearance. . . . . *pluvialis* Linn.

Table B. (Males.)

1. Third antennal segment black, abdomen black without any reddish side spots. First antennal segment very ovate and shining black. Wing markings dark. . *crassicornis* Wahlb.

— Third antennal segment reddish about the base. Abdomen brownish or greyish black, with reddish side spots on second and third segments. First antennal segment not extremely ovate and not all shining. Wing markings not conspicuously dark. . . . . 2.

2. Post-ocular eye fringe long and black, sometimes with an admixture of shorter brown hairs. Wings without a washed-out appearance. . . . . *pluvialis* Linn.

— Post-ocular eye fringe short and brownish yellow. Wings with a more or less washed-out appearance. . . . . 3.

3. Abdominal spots reaching to the second segment. First antennal segment ochreous yellow. . . . . *bigoti* Gobert.

— Abdominal spots reaching to the first segment. First antennal segment blackish. . . . . *italica* Meig.

Chrysozona pluvialis Linn.

C. pluvialis Linn., Fauna Suecica, p. 463, 1761.
C. equorum Fabr., Entom. Syst., IV. p. 376, 1794.

C. hietomantis Schrank, Fauna Boica, III. p. 155, 1803.
C. hyentomantis Schiner, Fauna Austriaca, Dipt., I. p. 39, 1862.
C. serpentina Wied., Ausser. zweif. Ins , II. 1830.

Plate II. Fig. 1.

Undoubtedly the commonest species of the genus in the South of England, and on the wing from mid-May to mid-September, occasionally even to October. It seems to occur anywhere and everywhere where there is water or moist earth.

Abdomen dark mouse-grey in both sexes, the male with reddish side spots to some or all of the first three segments. Abdomen in both sexes with a not too distinct pale dorsal line, and with a row of greyish spots on either side nearly always reaching up to the third segment, frequently more or less visible on the second segment, but never on the first. Wing markings neither dark nor washed-out, and, therefore, intermediate between *crassicornis* and the other two species. Antennae intermediate in total length between *italica* and *crassicornis*. Wing markings in discal cell usually as in Plate II. Fig. 2.

The first segment of the antennae is in both sexes less swollen or ovate in *pluvialis* than in *crassicornis*; it is, however, more so in the males of both species than in the females, so that in male *pluvialis* it is frequently as ovate as in female *crassicornis*.

Variation.

There does not appear to be any striking variation in this species, and long series of both sexes show but a slight variation in the extent of the reddish abdominal side spots in the male, and in the intensity of the pale abdominal spots and their presence or absence on segment 2 in the female. Three forms have, however, been described on the Continent, one of which, *lusitanica* Guér., is unlikely to occur in Britain.

pluvialis **subcylindrica** Pand. (1883, Revue d'ent. de Caen, II. p. 196).

Male.—First antennal segment greyish for the basal two-thirds, the rest shining black. Third antennal segment reddish brown at the base. Wings with large white blotches, the inner margins edged with white. Abdomen blackish as in *crassicornis*, the pale spots reaching to the 4th or 3rd segment.

Female.—First antennal segment slender and cylindrical as in *italica*, but short as in typical *pluvialis*, shining black with some whitish hairs on the outsides. Inner margins of wings dull, the white markings much reduced. The discal cell contains but two white streaks. Pale abdominal spots on 4th to 6th segments.

I have not seen a British example of this form, but it has occurred in France and Germany and should be found here.

pluvialis **hispanica,** Szil. (1923, Biolog. Hung., I. p. 38).

First antennal segment almost or quite without the constriction just before the tip, and almost all dull. Third antennal segment brownish at the base only. Middle dark spot on the frons in the female very small. Wing cell M with five clear round white spots, or they may be united so as to form two white rings. Spots on the inner wing margin wanting.

I have a female from Matley Bog, New Forest, 12 July, 1930, which agrees with the above in all details except the markings in cell M. It is rather small in size. The form has been recorded from Spain, Italy, and Germany.

Chrysozona crassicornis Wahlberg.

C. crassicornis Wahlb., 1848, Oefr. Svenska. Vet. Akad. Foerhandl., V. p. 9, 200.

C. americana (Forst.) Osten-Sacken (1876). Mem. Boston Soc. Nat. Hist., II. p. 457.

Kroeber (in Lindner Die Fliegen der Pal. Reg., Tab., 1925; and in Archiv. f. Naturg. LXXXVIII. 1922) gives *globulifera* Schumm. 1837 as a synonym of *crassicornis* Wahlb. apparently through having misread Verrall, vol. V. List at end p. 6. Verrall did *not* give this synonymy. If it had been correct *globulifera* Schumm. 1837 would have had 11 years priority.

This species is local, but is probably much more widely distributed than the rather limited number of records imply; it is probably almost always confused with *C. pluvialis* which it certainly strongly resembles, though when once the differences are recognised distinction becomes easy.

Both sexes bear a general resemblance to *C. pluvialis*, but are distinctly darker in appearance and the antennae are on an average somewhat shorter. The male is without the reddish side coloration of *pluvialis* on the first few abdominal segments, and this, combined with the very ovate shining black first antennal segment and the darker wing markings, usually makes identification easy. The female has the first antennal segment more ovate and shining black than in *pluvialis* though not nearly so ovate as in the male. The abdomen is darker grey, and is without the pale dorsal line. The wing markings are conspicuously darker and the markings in the discal cell are usually as in Plate II. Fig. 3.

The species is on the wing from mid-June to mid-August, and there are odd records from the majority of the English and Scotch counties, whilst Mr. H. W. Andrews took it in S.W. Ireland in 1907. It is evidently commoner in Scotland, perhaps replacing *pluvialis* as the commoner species in some parts.

Variation.

The species is not much subject to variation, but one form of the female has been described on the Continent.

crassicornis **tamerlani** Szil. (1923, Biol. Hung., I. p. 34).

Eyes with short white hairs, frontal callosity variable but distinctly concave above. Upper half of antennal basis strongly arched with two oval cavities. Three velvety spots, the side ones oval. Clypeus with two side spots. Antennae 1½ times as long as the head, quite black. First antennal segment long oval, about 2½ times as long as broad. Abdomen black, outer margin and middle triangle of second segment bright grey, the last segments with two pairs of rounder side spots or with smaller median band and three pairs of side spots.

Apparently taken in Hungary, but locality not clear.

Chrysozona bigoti Gobert.

C. bigoti Gob., 1881, Mem. Soc. Linn. du Nord de la France, XXXVIII. p. 3.

A small to medium-sized species, usually about the same size as *pluvialis*, but the more washed-out wing markings catch the eye at once, whilst the rather conspicuous abdominal markings from the first segment onwards (second segment in the male) are very characteristic. Middle and hind femora more or less orange yellow. Post-ocular eye fringe in the male short and tawny. Wing markings in discal cell usually as in Plate II. Fig. 5.

According to Verrall the species was first recognised as British by Col. Yerbury, who took four females at Walton-on-the-Naze, Essex, in August, 1907 ; there is, however, a specimen in the British Museum collection labelled "Gravesend, Kent, July 29th, 1906, Col. Yerbury," which, presumably, he did not recognise at the time. A still earlier specimen, apparently also unrecognised at the time, is labelled "Alresford, Essex, July 1902, B. S. Harwood," and is also in the British Museum.

Other records are Aldeburgh, Suffolk, Aug., 1922, (Brit. Mus. collection) ; Arne, Dorset, where I took 8 females on Aug., 11th, 1929, and Aug. 3rd, 1930, and Messrs. J. E. Collin, F. H. Haines, and C. J. Wainwright took others on the latter date ; and Tickenham, Som., where Mr. H. W. Audcent advises having taken 1 female in 1922.

The species appears to frequent coast marshes, none of the recorded captures being very far from the sea.

Variation.

The small number of specimens taken in Britain does not show any striking variation. Two forms have been described abroad, *monspellensis* Villen. from S. France, and *ocelligera* Kroeber from N. Africa.

Chrysozona italica Meigen.

C. italica Meig., 1804, Klassif. und Beschr., I., p. 163.
C. elongata Le Pell., 1825, Enc. Méthod., X., p. 543.
C. gymnonota Brullé, 1832, Exped. Scien. Morée, III., p. 306.
C. tenuicornis Macq., 1834, Hist. Nat. Diptères, I., p. 210.
C. longicornis Macq., 1834, Hist. Nat. Diptères, I., p. 211.

The more elongate abdomen of this species gives it a larger appearance than the preceding species.

Male. End segment of palpi short conical, about 1½ times as long as broad. First antennal segment much swollen, less than twice as long as broad, shining black, grey dusted basally. Third antennal segment bright reddish yellow with black tip. Postocular hairs long and tawny, black towards the sides. Abdomen with reddish sides to the first three segments, and with whitish margins to segments 1 to 6 and bright side spots as far as segments 4 to 5. Middle triangle on segment 2 very short.

Female.—First antennal segment long and cylindrical, almost as long as the head, dull black or grey. Third segment black or grey, deep black at the tip. Abdomen with the median triangles very narrow and sharply defined, the side spots scarcely extending up to segment 4.

Wings in both sexes with distinct washed-out appearance, and wing markings in discal cell usually as in Plate II. fig. 4.

C. italica Mg. is not a common species, and appears to be attached to maritime situations. It is evidently not uncommon in the Essex and Suffolk salt marshes, and was taken there in some numbers by Mr. G. H. Verrall and Col. J. W. Yerbury in August, 1907. Other records are largely single specimens only; Kentish Coast and Balcombe, Sussex, 1869, E. Newman; Netley, Hants, July 22nd, 1893, Miss Ricardo; Matley Bog, New Forest, Hants, Mr. Chawner (I have failed to find it there); Sheviock Wood, River Lynher, Cornwall, Sept. 4th, 1907, Col. Yerbury; Arne, Dorset, Aug. 24th, 1906, Col. Yerbury; Alresford and Colchester Essex, B. S. Harwood; and Thames Marshes, H. W. Andrews.

Variation.

The species does not show conspicuous variation, but a certain amount of variation takes place in the length of the first antennal segment, in the colour of the antennae, and in the ground colour of the abdomen. Four forms have been described by continental authors, two of which (*rotundata* Szil., and *grandis* Macq.) are unlikely to occur in Britain.

italica nigricornis Gobert (1881, Mem. Soc. Linn. du Nord de la France, XXXVIII. p. 210)=*gallica* Szil., (1923, Biolog. Hung., I. p. 37).

First antennal segment distinctly shorter and stouter though not

obviously ovate. Antennae black. Femora of at least the hind and middle legs reddish. Specimens either answering to this form, or approaching it, were apparently taken by Mr. G. H. Verrall and Col. Yerbury at Walton-on-the-Naze, Essex, and at Woodbridge, Suffolk, in August, 1907, judging by his descriptions in British Flies, Vol. V. Abroad it has been recorded from France, Spain and Italy.

italica **variegata** Fabr. (1805, Syst. Antliatorum, p. 109, 6).

Female.—Antennae reddish, only the apical half of third segment black. Frontal callosity brownish black. Legs reddish except the coxae. Wings brownish with the inner marginal cells without whitish markings.

Male.—(after Szilady, 1923, Biol. Hung., I. p. 39). Similar to the male of typical *italica* but the abdomen without the reddish side coloration and the whitish margins to segments, thus resembling the female.

It would appear from Verrall's description that most of the specimens taken by him and Col. Yerbury in Essex and Suffolk had more or less reddishness about the third antennal segment; but they could not otherwise have approached this form as on p. 346 of "British Flies" Mr. Verrall refers to *variegata* as being "very distinct."

This form has been recorded from Central and Southern Europe, and from Northern Africa.

III. SUB-FAMILY TABANINAE.

Very large to moderate sized species of a more or less robust build. Abdomen blackish, greyish, brownish, reddish-brown, reddish, or even bright orange; usually with one or more rows of triangles or flecks. Eyes bare or hairy. Middle tibiae with two apical spurs, hind tibiae without spurs. Wings clear, showing little variation, sometimes with a recurrent veinlet to R_4.

Eyes touching in the males for a short or long distance, well separated in the females by a broad frontal band or stripe bearing two usually shining black calli (rudimentary in genus *Atylotus*); the upper callus is usually more or less linear and joined to the lower callus, but occasionally it is not linear and separated. An ocelligerous tubercle at the vertex of the frons either present or absent. Third antennal segment with four rings at the tip.

The characters used for separation into genera are firstly the eyes being bare or hairy, and secondly the presence or absence of an ocelligerous tubercle at the vertex. Two further characters used by Prof. Enderlein, are the presence or absence of a recurrent veinlet to R_4 (by which he further sub-divides the genus *Atylotus* Osten-Sacken) and the upper eye facets in the males being enlarged, or uniformly small. The first is a character which is rather unreliable,

and in this paper I have felt unable to admit this further division to more than sub-generic rank; the latter involves the establishment of genera on a character confined to the male sex, and is, therefore, useless in tables of identification, particularly in the case of Tabanidae where it is usually females which are taken.

TABLE OF GENERA OF SUB-FAMILY TABANINAE.

1. Eyes bare, or practically so. No ocelligerous tubercle present. Females with well developed frontal calli. . *Tabanus* Linn.
   NOTE. A very fine and sparse pubescence can sometimes be detected on all except the very large species.

— Eyes distinctly hairy. Ocelligerous tubercle present or wanting. Females with or without well developed frontal calli. . 2.
   NOTE. The hairs on the eyes are usually obvious, but in the females of some species they are not easily seen unless the light be at just the right angle.

2. Ocelligerous tubercle present. Wing vein R_4 usually without a recurrent veinlet. Females with well developed frontal calli. . . . . *Therioplectes* Zell. *sensu* Brauer.

— Ocelligerous tubercle absent. Wing vein R_4 usually with a recurrent veinlet (usually absent in *A. plebejus*). Females with frontal calli rudimentary or almost wanting. . . . . . *Atylotus* Osten-Sacken.

GENUS TABANUS Linné.

Tabanus Linn., Fauna Suecica, p. 463, 1761.

Genotype *Tabanus bovinus* Linn. *partim* Loew.

Originally proposed to include the whole of the then known Tabanidae, the genus as now restricted comprises species of medium to large or very large size and of stout robust build. In the males the abdomen usually tapers more or less regularly from segment 2 to a decided point. The hind tibiae without spurs, third antennal segment with four rings at the tip. Eyes bare or practically so, ocelligerous tubercle wanting. The British species have a dorsal band of pale triangles or spots down the middle of the abdomen, and frequently have bands of spots or flecks on either side also.

Enderlein has further separated the genus into two genera according as the upper facets of the eyes in the males are enlarged, or are uniformly small:—

Upper eye-facets enlarged = *Straba* Enderl.

Upper eye-facets not enlarged = *Tabanus* Linn. *sensu* Enderl.

This sub-division puts all the British species of *Tabanus*, except *T. bovinus* Linn., into *Straba* Enderl. (type *Straba sudetica* Zeller). Biologically this may be quite a sound division, but a character

confined to the male sex is of little use in a table for classifying into genera, particularly when, as in Tabanidae, it is the females which are usually taken. I cannot, therefore, give more than sub-generic rank to *Straba* Enderl. in this paper.

TABLE OF SPECIES OF GENUS *TABANUS* LINNÉ.

Eyes well separated = Females = Table A.
Eyes touching = Males = Table B.

Table A. (Females).

1. Very large species (18mm., to 24½mm.) reddish brown or brownish black with one row of dorsal median pale triangles on the abdomen. Eyes unbanded. . . . . 2.
— Large species (16mm., to 18mm.) or moderately large species (10mm., to 16mm.) abdomen with three rows of dorsal spots or flecks. Eyes banded or unbanded. . . . . 3.
2. Abdomen reddish brown with blackish dorsal band bearing a row of pale triangles, one to a segment. The triangles are long but stand on a wide base, and almost or quite reach the upper margin of each segment. Sides of triangles more or less concave. Hairs on femora always pale. Underside of abdomen with reddish or rose tinted side colouring on some or all of segments 1 to 4. Lower frontal callus bell-shaped, widest at base, nearly twice as long as wide, tapering and passing on to upper callus which narrows gradually to a point; about 1½ times as long as lower callus. (Plate II. Fig. 6). . . . . *bovinus* Linn.
— Abdomen darker reddish brown or brownish black; black dorsal band in dark specimens lost in the darker ground colour. Median triangles of varying shape, sometimes even concave sided. Hairs on femora frequently partly or entirely black. Underside of abdomen without reddish or rose-tinted side coloration, though sometimes a little red quite near the base. Frontal calli of varying form. (Plate II. Figs. 7-10). . . . . *sudeticus* Zeller.
3. Eyes in life unbanded. . . . . 4.
— Eyes in life with one or three bands. . . . . 6.
Note. Dried specimens should be relaxed, when the colour bands will usually return. This also applies to No. 6 below.
4. Large species (16mm., to 18mm.). Abdomen with three rows of light grey spots or flecks which stand out rather sharply against the blackish grey ground colour. . *autumnalis* Linn.
— Smaller species (13mm., to 16mm.). Abdomen with three rows of grey spots or flecks, ground colour not normally so dark and usually a mouse grey. . . . . 5.
5. Upper frontal callus longer than wide, and joined to the lower

callus by a narrow neck. (Plate II. Fig. 13). Abdomen usually reddish about the sides of the first three segments. . . . . . . *miki* Brauer.

— Upper frontal callus somewhat heart-shaped and quite isolated from the lower callus. (Plate II. Fig. 16). No red about the sides of the upper abdominal segments. *cordiger* Wied.

6. Eyes in life greenish blue with three purple bands. Upper frontal callus heart-shaped and isolated from lower callus. Frontal triangle shining black. (Plate II. Fig. 17). Slightly larger species. . . . . *glaucopis* Meig.

— Eyes in life with one purple band. Upper frontal callus more or less linear and joined to lower callus. (Plate II. Figs. 14 and 15). . . . . 7.

7. Abdomen with brownish grey or yellowish grey ground colour. Postocular rim not puffed out on the upper quarter of the eyes, but equal in width all round. Postocular ciliation greyish yellow, moderately long. No black hairs on the upper part of the side cheeks near the base of the antennae. . . . . . . *bromius* Linn.

— Abdomen with more greyish ground colour, usually a slightly smaller species than *bromius*. Postocular rim puffed out on the upper quarter of the eyes. Postocular ciliation brownish yellow, moderately long. Black hairs on the upper part of the side cheeks. . . . . *maculicornis* Zett.

Table B. (Males).

1. Eye facets all the same size, and small. Rather large species (about 20mm.). (Sub-genus *Tabanus* Linn., *sensu* Enderlein). . . . . *bovinus* Linn.

— Eye facets of the upper two-thirds enlarged, frequently sharply contrasted. Large (17mm., to 20mm.), or moderately large (13mm.), species. (Sub-genus *Straba* Enderl.). . . . . 2.

2. Abdomen with one row only of pale dorsal spots. Rather large species (about 20mm.). . . . . *sudeticus* Zeller.

— Abdomen with three rows of pale dorsal spots or flecks. Large (about 17mm.), or rather smaller species. . . . . . . 3.

3. Head *obviously* large, considerably wider than the thorax. Occiput with a long postocular eye fringe. . . . . . . 4.

— Head of normal size, slightly, but not obviously, wider than the thorax. Occiput without a long postocular eye fringe. . . . . 7.

4. Moderate sized species, eyes in life with one band. . . . 5.

— Larger species, eyes in life with *three bands. *glaucopis* Meig.

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*This character is given with reserve, vide the note on page 84, lines 37 to 45, when dealing with this species in detail.

5. Frons with a brown crossband at the level of the antennae. Palpi almost globular. No black hairs on side cheeks towards the base of the antennae. . . . . *cordiger* Wied.
— Frons without brown crossband. Palpi elongate oval. . . 6.
6. Abdomen with underside reddish, upper side reddish yellow with narrow black middle band. Head rather large. *miki* Brauer.
— Abdominal underside not reddish but blackish; upper side blackish grey with small brownish side flecks. Blackish hairs on the side cheeks towards the base of the antennae. . . . . . . *maculicornis* Zett.
7. Large species (about 17mm.); eyes in life unbanded. . . . . *autumnalis* Linn.
— Moderately large species (12mm., to 15mm.), eyes in life with one band. . . . . *bromius* Linn.

Tabanus bovinus Linné *partim* Loew.

T. bovinus Linn., 1761, Fauna Suecica, p. 462.
T. bovinus Loew, 1858, Verh. Zool. bot. Ges., Wien., VIII. p. 606.

A very large species (18mm., to 20mm.) which I find to be much less common than has been generally supposed. The male is easily distinguished (in Britain) by its uniformly small eye facets; the female is exceedingly like a more common form of the next species (*T. sudeticus*), but with care can be picked out by the form of the frontal callus, and by the reddish underside coloration of the abdomen.

Male.—Abdomen brownish orange or reddish orange on all the basal segments, but with the tip darker, somewhat pointed and tapering gradually from segment 2 posteriorly. A black dorsal band down the centre bearing a dorsal row of whitish triangular spots, one based on the lower margin of each segment and that on segment 2 with the top angle cutting up into the black band. The triangles are somewhat concave sided. Underside pinkish red, dusted grey and with darker middle band. Legs brownish, tibiae brownish orange, front tibiae with the apical third blackish. Eyes bare, in life greenish and unbanded. Facets all equally small.

Female.—Generally similar to the male in colouring, but without the pointed abdomen. Frontal stripe five to six times as long as wide at the base. Third antennal segment largely black. Stripes on thorax distinctly seen. Frontal callus as in Plate II. Fig. 6.

This species has hitherto been considered to be locally common, particularly in the New Forest, Hants; but a very close examination of large numbers of big *Tabanidae* from the New Forest and elsewhere has revealed that it is far from common, and that the bulk of the specimens taken belong to one or more of the several forms of the next species *Tabanus sudeticus.*

In certain Inclosures in the northern part of the New Forest,

however, it seems to occur more frequently, such as Roe Wood, Bratley Arches, Red Shoot, etc., and I find that Dr. F. H. Haines has a good series of females from these Inclosures. I observed it myself to be frequent in Roe Wood in July, 1929.

There are not many really authentic records of *T. bovinus* outside the New Forest, so that collectors who take the species would greatly assist our knowledge of its distribution if they would publish their captures. There are a number of records from various localities in Surrey (Weybridge, Woking, Oxshott, Farnham, etc.). Verrall took it in Abbotts Wood, near Polegate, Sussex; and there are odd records from Berkshire (near Reading); Huntingdonshire (Monks Wood); Cambridgeshire; Devonshire (Ivybridge and Clovelly common in 1918, C. W. Bracken); and Cornwall (Calenick, 1909, Rollason). It is more than likely, however, that some at least of these records belong to one or more of the forms of *T. sudeticus*, and no opportunity should be lost of verifying them.

There is a great scarcity of males in British collections; the only authentic British male with data that I have seen is in Mr. J. E. Collin's collection, and was from Lyndhurst, Hants, over 30 years ago. There are two males in the British Museum collection, from the Saunders and Clifton collections respectively, but without further data. All other British males of large Tabanidae sent me by correspondents had enlarged upper eye facets, and are dealt with under *T. sudeticus*.

Variation.—Beyond a partial lessening of the pinkish red colouring beneath the abdomen in some specimens, and a tendency in others to develop a darker abdominal ground colour, and thus to approach *T. sudeticus* in appearance, I have not seen much variation. I have noticed, however, that the figures of the frontal callus given in Surcouf (Tabanides de France, p. 168) and Séguy (Faune de France, Vol. XIII. p. 145) show the lower callus shorter and broader than my British specimens. Verrall (British Flies, V. p. 396) notes a similar difference compared with Brauer's figure. A critical inspection of more material than I have been able to examine, drawn from a wider area, may help to elucidate this point. I have not seen a series from the Continent. In either case the general shape of the callus is quite distinct from that of any of the forms of *T. sudeticus*.

It may, perhaps, be not out of place to mention here that this shorter and broader view of the lower callus can be produced artificially if it be viewed at an obtuse angle with a low magnification, and with the old-fashioned long barrelled microscope.

Tabanus sudeticus Zeller.

T. sudeticus Zell., 1842, Isis, XI. p. 815.

There has been a general impression in Hampshire, handed down from the last century, that this species does not occur in the New

Forest, and in spite of the opinion expressed by Verrall (British Flies, V. p. 400) this impression has persisted.

The examination of a considerable amount of material from the New Forest taken in 1928-29-30, has shown that not only does it occur there, but that it predominates in the open bogs in the South of the Forest, though *T. bovinus* holds its own in certain Inclosures in the northern part.

One of the forms of *T. sudeticus* so strongly resembles *T. bovinus* that it is small wonder that it has passed for that species in most collections. As little is known of the early stages of either species it may be found that their larvae feed up under quite different conditions ; for example *sudeticus* larvae may prefer, or require, wet bog or even water, whilst it may be that *bovinus* larvae live in the moist earth in woods. The point should be one presenting no great difficulty beyond a large measure of patience, and I intend to give it my attention this coming summer.

In view of the wide range of variation displayed by this species a general description of the two sexes would be little more than a recapitulation of the characters given in the tables ; I propose, therefore, to proceed to the question of variation, leaving the descriptions to appear with each form.

Variation.

With a short series only, such as is to be found in the average collection of diptera, *T. sudeticus* appears to be extremely and aggravatingly variable. A close study of long series, however, brings out the interesting fact that the species tends to centre round five forms, only two of which have hitherto been noticed. These forms are very distinct in the male sex, and there show sufficient differences to suggest that they may be something more than mere forms of one species. The females, however, are not so easily separated, and are particularly puzzling if one has no named types for comparison, and is trying to name such specimens for the first time. Prolonged study of a large number of female specimens has convinced me that the two best characters are the forms of the dorsal abdominal triangles and of the frontal calli respectively.

Mr. J. E. Collin has expressed his willingness to dissect out the genital organs of both sexes of each of the forms of this species described in the following notes, provided the requisite fresh material can be obtained next year ; the results of this work will, it is hoped, settle their status once and for all. Pending this they are here retained as forms of *T. sudeticus*.

Besides the form variation referred to above, further variation occurs in the colour of the bristle-like hairs on the palpi and first antennal segments, which vary from being all orange with few or no black hairs to nearly all black. I have noticed this variation only in the females and it appears to occur in all the forms.

The third antennal segment also varies in colour from being clear reddish with only the annulated tip black to nearly all blackish with just the base red.

The following are brief descriptions of the forms noticed above:—

sudeticus **sudeticus** Zeller (1842, Isis XI., p. 815).

Slightly larger than the remaining forms, and with a duller general appearance than all except *distinctus*. Abdomen with a very dark ground colour almost black in some specimens. Median triangles white or yellowish white with convex sides; not too distinctly outlined and with a tendency to round off the top angle. Lower margins of abdominal segments yellowish white in strong contrast to the dark ground colour. The hairs on the femora and pleurae are black. Females with the frontal callus as in Plate II. Fig. 7; lower callus small, about as wide as high, and with bottom edge varying from straight and four-notched to rounded and hardly notched at all. Upper callus linear, about three times as long as lower callus. Abdominal underside predominatingly dark with median band of broad black semicircular spots.

Widely spread and apparently not uncommon in Scotland in July-August. I have a good series from Nethy Bridge and Aviemore in Inverness, kindly taken for me by Mr. Philip Harwood, and have seen numbers of other specimens from the same district. Verrall records it (amongst other places) from Perthshire, Argyllshire, Nairn, and the Solway district.

The size and general shape of the lower frontal callus in the females is constant and characteristic, but an interesting point, which may be of importance later, is that in the distinctly notched specimens the lower edge of the callus bears a distinct resemblance to the form *perplexus*, whilst in those with a more rounded lower edge the resemblance is to the form *confusus*. There is no possibility of confusion with these latter, as the general appearance is so different, but it suggests a common origin.

Specimens occasionally occur in which the abdomen is not properly developed, the last few segments being pressed up together like a telescope. I have seen numerous females in this condition, and Mr. P. Harwood took one male in the same state during July, 1930, at Nethy Bridge, Inverness.

sudeticus **meridionalis** form. nov. Resembling typical *sudeticus* only in the general dark appearance, but slightly smaller and the ground colour of the abdomen a little more brownish red. The dorsal median triangles somewhat more distinctly outlined, very slightly convex or almost straight sided, equilateral or very slightly isosceles, and with the top angle not rounded off.

Lower margins of abdominal segments yellowish and rather contrasting with the ground colour, as in *sudeticus*.

Frontal callus in the females generally similar to *sudeticus* (Plate II., fig. 8) and the lower edge showing the same resemblance to the following forms as *sudeticus*.

This is the form in which *sudeticus* occurs in the Midlands and South of England. I have 2 females from Matley Bog, New Forest, July 5th, 1930. Mr. E. Ernest Green has sent me similar specimens from Woking and Camberley, in Surrey; and from Hartford Flats, in Hants, dates ranging from June 29th to August 10th.

There are female specimens in the British Museum collection from Chertsey, Surrey, Aug. 5th, 1907; Lightwater, Surrey, July 10th, 1928: Lyndhurst, Hants., Aug., 1893; and Blackdown, Hants., July 4th, 1925.

Mr. J. E. Collin sent me a female from the Forest of Dean, Glos., Aug. 2nd, 1897, Col. Yerbury. A female specimen in the British Museum collection from Derwentwater was somewhat intermediate between this form and typical *sudeticus* as was to be expected; whilst the specimen taken by Mr. Murray in Cumberland as recorded in the Entomologist, LV., p. 119, appears to be the same.

I have 1 male taken by Mr. B. M. Hobby in Brockis Hill Inclosure, New Forest, July 3rd, 1927, and there is also one in the British Museum collection labelled "St. Gennys, Bude, Cornwall, Aug. 9th, 1920."

Of considerable interest is a specimen clearly referable to this southern form taken by Mr. J. J. F. X. King as far north as Elgin, Aug. 20th, 1904, and now in Mr. H. W. Andrews' collection. The (for Scotland) late date suggests either a partial second brood or a larva feeding late in the season, which would perhaps explain the occurrence of the southern form in such a latitude.

sudeticus **perplexus** Verrall (1909, Brit. Flies, V. p. 399).

Very strongly resembling *T. bovinus* in both sexes, but easily distinguished in the male by the enlarged upper eye facets, and in the female by the quite different and distinct frontal callus, and absence of extensive pinkish underside coloration.

Abdomen in both sexes brownish red ground colour, the lower margins of segments a paler shade and not particularly sharply contrasted. Dorsal median triangles whitish on a black dorsal band, which latter is visible against the less dark ground colour. The triangles resemble those of *T. bovinus* and are in some specimens distinctly concave sided, with the sharply pointed top angle of that on the second segment having a tendency to cut high up into the black dorsal band as in *T. bovinus*.

Male with the upper eye facets distinctly enlarged, and with the abdomen slightly but distinctly less pointed that in *bovinus*.

Female with the postocular eye fringe brown at the top of the head becoming paler down the sides, and with a very distinct frontal callus (Plate II., Fig. 9) quite unlike that of *bovinus*. I have only one English specimen with the lower callus quite as long as that figured by Verrall in British Flies, V., p. 400, which was taken by Mr. E. Ernest Green in Cornwall, July 27th, 1925; but Mr. J. E. Collin advises me that most of the Irish examples taken by Col.

Yerbury in Co. Kerry, June-August, 1901 (from which this form was described) have this longer lower callus. Specimens from Stradbally, Kenmare, and Glengariff, kindly lent me by Mr. H. W. Andrews, have a slightly shorter lower callus more like that of the New Forest specimens, though all have the characteristic general shape. I have found this form to be generally distributed on the open bogs and boggy heaths in the South of the New Forest, such as Matley and Denny Bogs, Rhinefield Walk, and near Lyndhurst. Mr. E. E. Green has recorded it from Cornwall, and Mr. Verrall mentioned a capture in Woolmer Forest, Hants, by Col. Yerbury, July 12th, 1903. Both Mr. H. W. Andrews and Mr. B. S. Harwood have sent me males of this form, each bearing the late F. C. Adams' label; they are from Lyndhurst, July 11th, 1903, and July 17th, 1904, respectively. Mr. J. E. Collin very kindly allowed me to inspect the "male variety of *sudeticus*" which Verrall described on p. 399 of British Flies, Vol. V., and in my opinion it is a male of this form also. I have also an old male in but moderate condition labelled simply "Wales."

I am convinced that some at least of the six males of "*T. bovinus*" taken by Mr. H. P. Jones in the New Forest in 1921 (Entomologist, 1922, p. 41) belonged to this form of *T. sudeticus*. Mr. Jones did not examine the eye facets at the time, and the specimens are, unfortunately, not now in his possession. He tells me, however, that he distinctly remembers the tawny appearance of most of them, and as they were taken on Rhinefield Walk where *perplexus* is common and *bovinus* very rare I feel justified in concluding that they belonged to the former. The one figured by Miss Pearce however (Typical Flies, III., p. 31) was the following form *confusus*.

sudeticus **confusus** form. nov.

Male.—Darker than *perplexus* though not nearly so dark as typical *sudeticus* or *meridionalis*. The ground colour is a warm dark chestnut brown, somewhat shining, and with the dorsal abdominal triangles very clearly and sharply defined. The triangles are small, almost equilateral, and straight sided. Upper eye facets distinctly enlarged. Abdomen decidedly pointed, tapering gradually from the middle of segment 2.

Female.—Somewhat resembling the male, but with the abdomen not so pointed. The dorsal abdominal triangles are not, however, so constant in size and shape as in the male, being occasionally larger; in about one specimen in ten that I have examined the top angle of the triangle on segment 2 cuts up slightly into the black dorsal band (in this form almost invisible against the darker ground colour) as in *bovinus* and *perplexus*. Lower frontal callus of quite a different shape from *perplexus*, being pear-shaped and without the broadly-arched upper shoulders (Plate II., Fig. 10).

Postocular eye fringe whitish, if anything a little longer than in *perplexus*, and usually with some stouter black bristly hairs behind about the centre of each eye.

I have found this form to be abundant in the south of the New Forest, where it predominates and forms more than half of the large Tabani met with. It is common at Matley Bog, Denny Bog, Rhinefield Walk, Brockenhurst, Busketts Lawn, Lyndhurst, etc. Mr. W. Fassnidge took a female close to Southampton July 8th, 1923, and there are specimens in the Hope Dept., Oxford, from Bude, Cornwall. It is apparently common also in S.W. Ireland, for Mr. H. W. Andrews has specimens from Stradbally, Glengariff, and Kenmare, whilst Mr. Alan Druitt sent me a pair from Farran, Co. Cork, taken in August, 1927.

Males of this form seem to be taken more frequently than the others, presumably because it is the most common. Most of the big Tabanid males kindly sent me by correspondents were found to belong here.

Both the specimens figured by Miss Pearce in "Typical Flies" as *T. bovinus*, the male in Vol. III. fig. 31, and the female in Vol. I. fig. 42, belong to this form of *sudeticus*; the excellence of the photographic reproductions enables this to be clearly seen.

I feel convinced that Verrall had this form before him when he wrote of *perplexus* (British Flies, V. p. 400) that it was "remarkably intermediate between *T. bovinus* and *T. sudeticus*, but in general appearance is nearest to *T. sudeticus*." This description applies well to *confusus* but hardly to *perplexus*. The specimen selected by him, however, from which to make his excellent figure of the female frontal callus on the same page was from the form I have described under the name *perplexus* (thus dispelling any doubt as to which form this name applies), and which in long series is remarkably like *T. bovinus*.

sudeticus **distinctus** form. nov.

Male.—Quite different in shape from the males of *T. bovinus*, and of the forms of *T. sudeticus* already described; the sides of the abdomen are almost parallel down to segment 4 and then taper rapidly to a blunt point, whereas in all the other forms the male abdomen tapers steadily from segment 2. In this it would seem to resemble the genus *Therioplectes* Zeller, *sensu* Brauer (=*Sziladynus* Enderl.) rather than *Tabanus*. Ground colour of the abdomen tawny brown to chestnut brown, the lower margins of each segment more yellowish brown, including segment 1. A narrow dorsal black band faintly visible against the ground colour, but very indistinctly defined. Dorsal median triangles present, but very indistinctly outlined; sides of triangles decidedly convex with the top angle rounded off, thus most resembling the northern form of *sudeticus*. Underside greyish yellow, reddish towards the base, and with a median band of semicircular black spots considerably smaller than *sudeticus*.

Some black hairs on the hind femora, but those on the middle and front femora paler. Tibiae brownish, those of the hind legs darker. Hairs on pleurae not black. Eyes not examined when

alive or freshly killed, but in dried specimens of the dark tint of *sudeticus*. Antennae with the first two segments and the base of third segment reddish, remainder of third segment blackish.

The general appearance of the insect is dull and washed-out.

Female.—In general appearance resembling the male ; larger than the two preceding forms, and about as large as Scotch specimens of *sudeticus*. All femoral and pleural hairs pale. Tibiae paler than in the male, front tibiae blackish at the tarsal end. Basal segments of antennae reddish, third segments missing from both specimens examined. Dorsal abdominal triangles just as indistinct, but the top angle not quite so rounded off. In other respects similar to the male.

The above description has been made from 2 males and 2 females which had puzzled me considerably for some time. My attention was first drawn to this form by a male taken by Dr. F. H. Haines near Hawkhill Inclosure, Beaulieu, New Forest, July 19th, 1928. The capture of a second specimen in the New Forest by Mr. Harwood, also in July, 1928, but only recently seen by me, disposed of a suggestion that it might be a freak.

A female with the same characteristic dull appearance and indistinctly defined dorsal triangles was taken by myself in Busketts Lawn Inclosure, New Forest, July 9th, 1928, and I have received from Mr. J. A. Garner a similar female labelled "Bordon, Hants, July, 1921, W. Crocker." In the British Museum collection I found a third female labelled "Ivybridge, S. Devon, July 26th, 1889, Col. Yerbury." Kroeber, in Lindner, Die Fliegen der Pal. Reg., Tabanidae, p. 127, under *sudeticus perplexus* records a female from Bozen with triangles "wanting," which I rather think may belong to this form.

The frontal callus of the female, from the two specimens in my possession, is as in Plate II., Fig. 11, and is, therefore, nearest to the form *confusus*.

It is with some hesitation that I record this form from two males and three females only, but I have done so firstly because it is so distinct in every way, and secondly because I feel that my doing so will cause others to look for and probably find it in other parts of the country.

At present it must be recorded as rare, Hampshire and Devonshire, and I should be particularly pleased to hear if and when further captures are made.

Tabanus autumnalis Linné.

T. autumnalis Linn., 1761, Fauna Suecica, p. 462.
T. auctumnalis Zell., 1842, Isis, XI., p. 816.
T. bovinus Harris, 1780-2, Expos. Engl. Ins., p. 27, pl. 7, fig. 1.
T. autumnatus Schrk., 1803, Fauna Boica, III., p. 153.

A large species, though not quite so large as the two preceding species. Distinguished from them by the side rows of abdominal spots in addition to the median triangles.

Male. Eyes bare unicolorous and unbanded, the upper facets much enlarged and sharply contrasted with the lower and smaller facets. Antennae blackish brown. Femora blackish with long pale hairs, tibiae reddish. Abdomen very variable, it being difficult to find two specimens exactly alike. Usually the sides of at least abdominal segments 1 and 2 are pinkish or reddish, and in some specimens this is much extended. There is a dorsal band of whitish triangles on a black central band usually not too clearly defined, and side bands of flecks or spots placed obliquely which can be clearly seen even on the extreme red specimens. Underside reddish with black middle band, tip of abdominal underside black.

Female. Normally without any pinkish or reddish abdominal colouring, otherwise it has a general resemblance to the male. Ground colour of abdomen black with pale grey middle triangles and side spots, the latter placed obliquely outwards and downwards. Underside pale grey with darker middle band. Frontal callus as in Plate II., Fig. 12. Length 17·0-18·6mm.

VARIATION.

A long series shows considerable variation in the ground colour, from a deep shining black with small triangles and flecks to a more greyish black with larger triangles and flecks.

autumnalis **brunnescens** Szil. (1914, Ann. Mus. Nat. Hung., XII., p. 671).

Male. Zone of small eye facets twice as wide, and wider laterally; first two antennal segments reddish; abdomen with ground colour mostly reddish, much more so than in typical *autumnalis*, and the dorsal black band bearing the median triangles narrower and more in contrast to the ground colour.

Female.—Generally similar to typical *autumnalis*, but with a considerable admixture of pinkish red in the ground colour of the abdomen, and thus more like the normal male of typical *autumnalis*.

Length 16·0-18·2mm.

This form has been described from the south of Europe and North Africa, and was at one time considered to be specifically distinct. Specimens occasionally occur in Britain with red abdominal coloration in the female and with much increased red coloration in the male; there are several such females in the British Museum collection, one being labelled "Gravesend, July 29th, 1906, Col. Yerbury." Mr. H. W. Andrews has two very red males from Chattenden, Kent, but I have been unable to make out in these specimens the enlarged zone of small eye facets referred to by the author. There are reddish males in the British Museum collection labelled "N.E. Essex, W. H. Harwood," and "Lewes, Sussex, 1865, Verrall."

T. autumnalis is not uncommon in the south of England and has been recorded from most of the counties in this area, including the Isle of wight. It has not, however, as far as I have been able to trace, been recorded further north than the Midlands and Wales.

Mr. H. W. Andrews had the unusual experience of finding the male of this species in abundance in Chattenden Wood, Kent, on July 12th, 1902. He had the good fortune to arrive there (between 4.0 and 5.0 p.m.) just after a large emergence had taken place, and they were sitting about on the tree trunks and fences in numbers. In his note of this (Entom. Mo. Mag., 1903, pp. 38-39) there is a misprint, as " 18 females " in line 6, p. 39, should read " 18 males."

Tabanus bromius Linné.

T. bromius Linn., 1761, Fauna Suecica, p. 463.
T. atricornis Meig., 1838, Syst. Beschr., VII. p. 59. (p.p.).
T. bronicus Gimmel., 1847, Bull. Soc. Nat., Moscow, XX. p. 182.
T. connexus Wlk., 1850, Ins. Saund., Dipt., I. p. 62.
T. connexans Ric., 1905, Ann. Mag. Nat. Hist. (7) XVI. p. 200.
T. maculatus de Géer, 1776, Mem. Ins., VI. p. 221.
T. nemoralis Meig., 1820, Syst. Beschr., II. p. 50 (p.p.).
T. scalaris Hoffgg., in Meig., 1820, Syst. Beschr., II. p. 50.

A moderate sized species with a greyish yellow appearance and three rows of triangles or flecks; very common in the south, but not recorded from the north.

Male.—Eyes apparently bare, but a few short hairs can be seen with good magnification and the light at just the right angle, in life bronze green with one purple band just below the middle which does not quite reach the hind margin. Postocular rim very narrow and pale. Postocular eye fringe brownish yellow and short. No long tuft of hairs at the vertex. Thorax dark grey with five paler stripes more easily seen from behind than in front. Abdomen with ground colour greyish black, except the sides of segments 2 and 3 which are more or less reddish; a dorsal row of greyish yellow triangles, not always clearly defined, that on segment 2 being the largest. On either side a lateral row of obliquely placed flecks or spots. Underside of abdomen darkish grey with reddish side colouring on segments 2 to 4 forming a reddish band of varying width. Legs, femora blackish grey, tibiae pale reddish brown the apical half sometimes darker.

Female.—Resembling the male, but reddish side spots on abdominal segments 2 to 3 not nearly so pronounced, nor of such frequent occurrence. Underside greyish drab with a vaguely defined darker middle band; sometimes some obscure reddish coloration is apparent similar to the male.

Antennae in both sexes varying from blackish to reddish but the tip of segment 3 black. Dorsal hump on the latter blunt, more

distended in the female than in the male. Frontal callus as in Plate II., Fig. 14. Length 11·6-19·6mm., but Mr. J. W. Saunt has a ♀ specimen from Badby, Northants, July, 1928, which is under 10mm. in length.

T. bromius is easily the commonest species of the genus in the south of England, and it seems to occur in every suitable situation in almost every southern county. It does not, however, appear to go very far north, being rare beyond the Midland counties and unknown in Scotland.

VARIATION.

The species is a somewhat variable one. Besides the wide range of antennal coloration already referred to, the ground colour of the abdomen varies from dark grey to a lighter shade, the triangles and side flecks from grey to a distinct ochreous shade, and the reddish abdominal side coloration is sometimes more distinct. The wing vein R_4 occasionally has a recurrent veinlet; I have a specimen from Tickenham, Som., June 23rd, 1929, with this on the left side only, and Mr. H. J. Falkner sent me one (presumably from Devonshire) with a recurrent veinlet to both wings.

bromius **glaucus** Meig., (1820, Syst. Beschr., II., p. 51).

After some hesitation I retain this name for the rather distinct form of the male with conspicuous reddish side spots to abdominal segments 2 and 3, occasionally extending to segments 1 and 4. The form has a darker appearance than typical *bromius*, the abdomen is slightly longer narrower and more pointed, and has more extensive reddish coloration on the underside. Females with extended reddish abdominal side coloration also occur, and Mr. J. W. Saunt has quite a number of them from various places in Warwickshire and Gloucestershire.

T. glaucus was described by Meigen as a separate species, but Villeneuve and Surcouf, who have examined his types in Paris, state that the male is a variety of *bromius* Meig., whilst the female is a specimen of *T. tergestinus* Egger.

Verrall (British Flies, V., pp. 404-5), whilst expressing some doubt, retained *T. glaucus* Meig., as an unsatisfactory species, and he appeared to suspect that his specimens might be *T. miki* Brauer.

The *Tabanus glaucus* of Walker was our *T. maculicornis* Zett., which has apparently led Kroeber into the error of showing *glaucus* Meig. as a synonym of *T. maculicornis* in Lindner, Die Fliegen der Pal. Reg., Tabanidae, p. 118.

Tabanus miki Brauer.

T. miki Brauer, 1880, Densk. Akad., Wien, XLII., pp. 195-197.
T. graecus Meigen, 1820 (nom. praeocc. *T. graecus* Fabr., 1794).

The female generally resembling *T. bromius* form *glaucus*, but

can be distinguished immediately by the unbanded eyes in life. *T. cordiger* also has unbanded eyes in the female, but the upper callus is isolated and heart-shaped, whereas in both *T. bromius* and *T. miki* it is normally linear or spindle-shaped and not isolated.

Male. Head obviously large, strongly convex behind. Eyes with the facets of the upper two-thirds enlarged, green with one purple band along the line of demarcation of the large and small facets. Postocular eye fringe long and black. Antennae reddish, darker at the tip of segment 3.

Thorax blackish grey with darker bands. Halteres yellowish white. Tibiae light brown, apical half of front tibiae darker. Abdomen reddish yellow with somewhat narrow dorsal median blackish band, lower edge of segments 1 and 2 bearing a yellowish white central mark. Underside reddish yellow without median band.

Female. Eyes in life coppery green, unbanded, apparently bare, but microscopically fine hairs are present. Frontal callus rather like that of *T. bromius* but in my specimens the lower callus is more rounded and does not approach quite so closely to the eye margins as in *T. bromius.* (Plate II., Fig. 13.)

Antennae of a slightly brighter red than in *bromius*, and the same applies to the tibiae.

Abdomen generally rather similar to that of *T. bromius*, but in a series the median band of triangles are seen to be less distinct in *T. miki* than in *T. bromius*, and the sides of segments 2 and 3, particularly of 2, are distinctly reddish in all specimens that I have seen. Underside reddish grey.

Length 13·2-16·0mm.

On July 19th, 1930, I was carefully examining *Tabanidae* on Rhinefield Walk, in the New Forest, when I noticed amongst the swarms of *T. bromius* which were settling on my nether garments a female with unbanded eyes. Careful search resulted in one more specimen being taken. A critical examination at home showed them to be *T. miki* Brauer, and an addition to the British List of Tabanidae.

A visit to the same spot on July 25th produced 4 more female specimens. On August 3rd, 1930, I again visited Rhinefield Walk, this time accompanied by Messrs. J. E. Collin, F. H. Haines, and C. J. Wainwright, and 2 more females were secured by the former. I was unable to visit the spot again until August 24th, when 1 more female fell to my net. No males were taken.

Examination of other local collections has shown the following specimens taken, but not recognised. One female by F. J. Killington, Matley Bog, New Forest, July 4th, 1930. One female by H. W. Andrews, Brockenhurst district, July 8th, 1904. Three females by Dr. F. H. Haines, from Linwood, July 16th, 1925, Boldre Wood, August 11th, 1925, and Oakers Wood, Moreton,

Dorset, July 27th, 1911, respectively. Mr. J. W. Saunt has two specimens from Bubbenhall, Warwks., July, 1914, which I consider are this species.

It is no easy matter to determine this species if the specimens are old and dried, and the presence or absence of the eye band was not noted in life. I rather think that the species will be found in a number of collections under *T. bromius* or *T. glaucus.*

Mr. J. E. Collin has in his collection the two females from which the late G. H. Verrall described *T. glaucus* in British Flies, V., and after carefully examining them he has decided that they are both *T. miki.* They were both taken near Lyndhurst, New Forest, one on June 24th, 1895, and the other by Mr. H. Donisthorpe, date not recorded. Mr. Verrall states in his description that the eyes were not examined in life.

Tabanus cordiger Wiedemann (in Meigen).

T. cordiger (Wied.) Meig., 1820, Syst. Beschr. Zweifl. Insktn., II., p. 47.

T. atricornis Meig., 1838, Syst. Beschr. Zweifl. Insktn., VII. p. 59 (p.p.).

T. latifrons Zett., 1842, Dipt. Scand., I., p. 106.

T. vicinus Egger (nec Meig.) 1859, Verh. Zool. bot. Ges. Wien, IX., p. 391.

T. braueri Jaennicke, 1866, Berl. Ent. Zeit., X., p. 82.

T. megacephalus Jaenn., 1866, Berl. Ent Zeit., X., p. 82.

Male.—Head obviously large. Eyes apparently bare, microscopically hairy. Upper facets enlarged and sharply divided from the others; when dry the larger facets appear reddish purple and the smaller facets black. Eyes in life light brown with a purple band along the line of demarcation of the large and small facets. Hairs on face and side cheeks long silvery white, no black hairs. Frontal triangle white with a chocolate brown crossband at the base of the antennae and a black crossline near the apex. Antennae with the first two segments blackish brown or black, third segment obscurely reddish at the base. Femora dark grey, tibiae reddish brown the front tibiae darker on the apical half. Abdomen blackish grey, median triangles much reduced and indistinct. Side flecks obliquely placed and more conspicuous. Underside greyish.

Female.—Eyes bare and unbanded. Frontal triangle greyish yellow with a brown crossband at the base of the antennae as in the male. Frontal callus as in Plate II., Fig. 16, lower callus quadrate and almost as wide as the frontal band, upper callus not linear but almost as wide as the frontal band, somewhat heart shaped and isolated from the lower callus.

Abdomen generally resembling *T. bromius*, but without any

yellow tint. The spots and flecks are a light grey, and the ground colour being somewhat dark, the spots appear more contrasted.

Length 12-16mm.

The species occurs locally in parts of the New Forest, but otherwise appears to be distinctly uncommon. It was not included in F. C. Adams' New Forest List in the Victoria County History of Hampshire, 1900, but he took it in 1904 (vide Entom. Mo. Mag., 1905, p. 139). My own specimens are from the Brockenhurst-Rhinefield district (Aldridge Hill Inclosure, etc.) where Mr. H. W. Andrews also took both sexes (vide Entom. Mo. Mag., 1905, p. 71). The males of *T. maculicornis* Zett. then recorded turned out to be *T. cordiger* Wied., a much more interesting capture. It has also been taken at Matley Bog, between Beaulieu and Lyndhurst.

Mr. E. Ernest Green took it at Selham, Sussex, July 16th, 1899, and has kindly given me the specimen. There are several records from Devon: Walkham Valley July 21st, 1889, Avon Valley May 27th-June 19th, 1896, whilst I found 1 male and 4 females labelled Dartmouth 1871 in an old south Devon collection of unknown origin purchased at Stevens' in 1929. The Rev. A. Thornley took it freely in Cornwall at Penrose near Porthleven June 19th-21st, 1928. Verrall records it from Worcester, Hereford, Glamorgan, and Merioneth, and in numbers from Nethy Bridge and Aviemore, in Inverness. A. E. J. Carter recorded the species from Comrie, Perthshire, July, 1907 (vide Entom. Mo. Mag., 1909, p. 65).

It is probably overlooked in south and middle England through its superficial resemblance to the common *T. bromius* and *T. maculicornis* though the unbanded eyes of the female in life and its very distinct frontal callus render distinction easy when more closely examined.

Tabanus glaucopis Meigen.

T. glaucopis Meig., 1820, Syst. Beschr., II., p. 48.

T. chlorophthalmus Meig., 1820, Syst. Beschr., II., p. 58.

T. ferrugineus Meig., 1804, Klass. Europ. Ins., p. 169, (p.p.) (nec *T. ferrugineus* Meig., 1820).

T. flavicans, Zell., 1842, Isis, XI., p. 819.

Male.—Head obviously large, deep, and semiglobular. Eyes with the upper facets enlarged and sharply separated. When dried the upper facets appear reddish purple and the lower ones black. Eyes in life stated by Brauer and others to have three purple bands as in the female. In the only male I have taken I formed the impression at the time that the eyes were *not* banded, and I did not notice this discrepancy with published descriptions until the specimen had been dry for some time, and all bands (if any) had gone. I notice, however, that Surcouf (Tabanides de France, p. 193) makes the same comment, so that the point requires investigation.

Frontal triangle yellow, bearing a shining black callosity about its centre. Antennae reddish. Abdomen somewhat small compared with that of the female, and tapering gradually to a point from segment 2. Ground colour greyish black with an ashy grey dorsal median band and side flecks on either side placed obliquely. The side flecks are strongly ochreous and there is a suggestion of reddish colouring in the ground colour of the sides of segments 2 and 3. Femora blackish grey, tibiae brownish red, apical half of front tibiae blackish.

Female.—Superficially resembling the male, but considerably larger; the abdominal side flecks a little more conspicuously ochreous and the reddish suggestion about the sides of segments 2 and 3 varying from obscure to prominent. Eyes in life green with three yellow-edged purple bands. Frontal triangle yellowish at the base, but with the upper half occupied by a large shining black callosity, usually larger than in the male. Frontal band bearing three black calli all isolated, the lower quadrate and shining, the middle more or less quadrate or heart-shaped and moderately shining, the upper dull, not shining, and often obscured by pubescence. (Plate II. Fig. 17.)

Length 13·5-16·0mm.

This species has until quite recently been considered very rare in Britain, and Verrall (British Flies, V. p. 420) could only record 3 females, one without data, and two from Goodwood, Sussex, July 30th, 1884.

Mr. B. D. Burtt was the first to find it in other than single odd specimens; he found it locally common about dew ponds on the Downs near Streatley, Berks, in 1922 and 1923 (vide Entom. Mo. Mag., 1923, p. 92; and 1924, pp. 17-18). It has now been found in abundance along the Hampshire chalk downs between Winchester and Salisbury; it was first taken there by myself on Aug. 5th, 1929, near Farley Monument, Hants, but was then apparently nearly over as only a dozen or so specimens were met with. In 1930 I first took it on July 6th, and by the end of the month it was out in large numbers. Good series were secured not only by myself, but by Messrs. J. E. Collin, B. M. Hobby, F. J. Killington, and C. J. Wainwright. No males were seen, however, in spite of careful search, though in 1929 two were taken, one by Mr. Killington which he kindly gave to me, and one by Mr. H. W. Audcent.

No specimens were seen in the valleys, but as soon as an altitude of two or three hundred feet above sea level was reached they began to appear. Mr. Burtt (loc. cit.) considered that the species breeds in dew ponds, but in this district these are very few and far between, and I rather fancy that they breed in the moist earth in the wooded slopes on the hillsides. A note on this species by myself appeared in Trans. Entom. Soc. Hants and S. Eng. V. pp. 88-89.

glaucopis **cognatus** Loew (1858, Verh. Zool. Bot. Ges., Wien, VIII., p. 602).

Sides of abdominal segments 2-4 reddish yellow. Side flecks of abdomen isolated and not united with the pale lower edge of each segment as in typical *glaucopis*. Wing vein R_4 with a recurrent veinlet. Length 13-17mm.

I have 1 female from West Wood, Sparsholt, Hants, which has the recurrent veinlet to R_4, and the distinct reddish side colouring up to abdominal segment 4, but the side flecks are not isolated from the lower margins of segments. It does not, therefore, quite come under this form, but nearly approaches it.

Tabanus maculicornis Zetterstedt.

T. maculicornis Zett., 1842, Dipt. Scand., Tab., I., p. 117.

T. glaucus Walker (*nec* Meig.) 1851-56, Ins. Brit., Diptera.

T. nigricans Egger, 1859, Verh. Zool. Bot. Ges., Wien, IX., p. 392.

T. glaucescens Schiner, 1862, Fauna Austriaca, Dipt., I., p. 36.

This species is somewhat smaller than the others, and can also generally be distinguished at sight from the swarms of *T. bromius* with which it mixes in the south by its more black and grey colour. The male is exceedingly like the male of *T. cordiger* Wied.

Male.—Head obviously large. Eyes bare, upper facets enlarged and sharply separated. Eyes in life brownish green with one purple band along the line of demarcation of the large and small facets. Side cheeks with blackish hairs towards the base of the antennae. Postocular eye fringe long, usually greyish with a few black hairs intermixed. Frontal triangle greyish with darker apex, no obvious brown crossband at the level of the antennae. Antennae reddish, the basal joint darker.

Abdomen usually short and narrow. Ground colour blackish with rather indistinct median triangles and side spots, especially the latter. Underside greyish black, hind margins of segments paler.

Femora greyish black, tibiae yellowish brown, the apical half of the front tibiae blackish.

Female.—Head smaller and of normal size. Eyes greenish with one purple band. Upper eye margin broad with a short erect brown postocular fringe. Upper side cheeks always with some black hairs near the base of the antennae. Abdomen with the ground colour blackish grey with pale grey median triangles and side flecks which are much more distinct than in the male. The species is without the ochreous tint of *T. bromius* besides being on the average smaller. Frontal callus as in Plate II., fig. 15.

Length 10-14·5mm.

T. maculicornis is a fairly common species in the south of England, though not nearly so abundant nor so widely spread as *T. bromius.* It has been recorded from most of the southern counties, but is not

included in the Rev. A. Thornley's Cornish list, nor in that for the Isle of Wight in Morey's Guide. It apparently ranges much farther north than does *T. bromius*, for it has been recorded from Perthshire. It is well spread and fairly common in Hampshire.

GENUS THERIOPLECTES Zeller 1842, *sensu* Brauer 1880. (=*SZILADYNUS* Enderlein, 1925.)

Therioplectes Zell., 1842, Isis, XI., p. 819.

Therioplectes Zell., *sensu* Brauer, 1880, Denks. Akad. Wiss., Wien, XLII.

Genotype *Th. micans* Meig.

Sziladynus Enderl., 1925, Zool. Anzeiger, LXII., pts. 7 and 8.

Genotype *Sz. aterrimus* Meig.

Whether this genus is to be called *Therioplectes* Zeller or *Sziladynus* Enderlein will not be known until after the next International Congress.

Therioplectes was erected by Zeller in 1842 with the briefest of descriptions "with hairy eyes in both sexes," and he referred to it two groups of species. The first group consisted of the five species *tricolor* Zell., *micans* Meig., *auripilus* Meig., *borealis* Meig., and *tropicus* Linn.

The 3 species referred to the second group, *fulvus* Meig., *rusticus* Linn., and *plebejus* Fall., have since been generically separated; and further study of the first species in group 1 (*tricolor* Zell.) has caused entomologists to realise that even if it be not quite congeneric with the second group species it has more affinities to them than to the first group.

In 1876 Osten-Sacken proposed the generic name *Atylotus* for the second group species and their American allies *bicolor* Wied., *fulvescens* Walk., etc. *A. bicolor* Wied. has been cited as the type.

In 1880 Brauer revised the position to date and carefully apportioned the 37 species then known to him as between *Therioplectes* Zell. and *Atylotus* Osten-Sacken. He placed *tricolor* Zeller in *Atylotus* and restricted the name *Therioplectes* Zell. to the remaining 4 of Zeller's first group species and their allies. Most unfortunately he did not cite a type species in so many words, but his first species was *micans* Meig.

In 1910 Coquillet (Proc. U.S. Nat. Mus., XXXVII., p. 614) either through blind adherence to what has been called the "first species rule," or through neglect to study the species in detail, cited *tricolor* Zell. as the type species of *Therioplectes* Zell., and in so doing unsettled a generic name which had been well established for 70 years and clearly defined for 30 years.

Under the International Rules of Zoological Nomenclature as they stand at present the first type citation must stand provided it is a species which was included under the genus at the time of its publication and was not doubtfully referred to it. The rules do not recognise a generic restriction if a type be not cited. On the strength of this, Enderlein, in his recent revision of the Tabanidae, has referred to *Therioplectes* Zell. only *tricolor* Zell., and such other species (*gigas* Herbst., *tergestinus* Egger, etc.) as he considers to be congeneric with *tricolor*; in consequence he finds our own species *micans* Meig., *tropicus* Linn., etc., to be without a genus, and he erects *Sziladynus* for their reception with type *Sz. aterrimus* Meig. (=*auripilus* Meig. of Zeller's first group).

Continental entomologists generally have followed Enderlein, but British dipterists have retained *Therioplectes* in Brauer's sense. No British work on the Tabanidae has appeared since Verrall in 1909, which was a year before Coquillet's action.

As the rule stands at the moment Enderlein is correct, but as I undertand that the question of giving validity under the rules to generic restriction without actual type citation is to be brought up at the next International Congress I am not bringing forward *Sziladynus* Enderl. to the exclusion of *Therioplectes* at the last moment so to speak. I have, therefore, used *Therioplectes* in this paper, and the reader may select whichever name the decision of the Commission causes to be the valid name for this genus.

The genus comprises those species which conform to the following description :—

Eyes hairy in both sexes, in life green with two or more purple bands. An ocelligerous tubercle present, more or less distinct. Head of the male not differing noticeably from that of the female in size and shape. Wing vein R_4 normally without a recurrent veinlet. The species are rather variable particularly in the abdominal colours and markings, and considerable care should always be taken in naming them. The species, particularly the last 4, are somewhat unstable. They thus tend to form local races which are rather puzzling to the student. Verrall (Brit. Flies, V. p. 771) records the finding of a particularly distinct race of *T. tropicus* Linn., by Col. Yerbury at Crymlyn Bog, in Glamorganshire.

TABLE OF SPECIES OF *THERIOPLECTES* ZELLER, sensu BRAUER.=*SZILADYNUS* ENDERLEIN.

Eyes well separated=Females, TABLE A.
Eyes touching=Males, TABLE B.

Table A. (Females).

1. Legs unicolorous, black. Frontal triangle shining black. Blackish species. . . . . *micans* Meig.
— Legs not unicolorous. Tibiae mainly yellowish. Frontal triangle shining black or not. . . . . 2.

2. Abdomen blackish grey with light flecks, and with only very moderate (if at all) dull reddish or brownish red colouring to the sides of the segments near the base. . . . . 3.
— Abdomen largely or mainly reddish brown or reddish orange down to about segment 4, with black remainder and black dorsal stripe. . . . . 6.
3. Frontal triangle shining black. Frontal stripe 3½-4 times as long as wide at the base. . . . . *luridus* Fall.
— Frontal triangle grey. . . . . 4.
4. Frontal stripe broad, 2½-3 times as long as wide at the base. . . . . . . *borealis* Meig.
— Frontal stripe not so broad, at least 4 times as long as wide at the base. . . . . 5.
5. Vertex with a tuft of black hairs behind the ocelligerous tubercle. Usually somewhat large species. Middle tibiae conspicuously pubescent. . . . . *tropicus* Linn.
— Vertex without any tuft of black hairs behind the ocelli. Usually somewhat smaller species. Middle tibiae only moderately pubescent. . . . . *montanus* Meig.
6. Reddish abdominal colouring extending to segment 4, segment 4 with short pale yellow pubescence. . *distinguendus* Verr.
— Reddish abdominal colouring extending to segment 3 only, segment 4 with short black pubescence. . *solstitialis* Meig.

TABLE B. (MALES).

1. Legs unicolorous, black. Frontal triangle shining black. Blackish species. . . . . *micans* Meig.
— Legs not unicolorous. Tibiae mainly yellowish. Frontal triangle shining black or not. . . . . 2.
2. Abdomen mainly blackish grey with only moderate reddish or brownish red lateral markings near the base. Eyes in life usually with three bands, one, however, occasionally weak or wanting. . . . . 3.
— Abdomen mainly bright brownish or reddish orange with a black dorsal stripe. Eyes in life with two bands. . . 6.
3. Upper eye facets considerably enlarged, and the line of demarcation somewhat sharply drawn. Head hemispherical. Abdomen shining black, lower margins of abdominal segments distinctly white. . . . . *borealis* Meig.
— Upper eye facets not conspicuously enlarged, though somewhat so, and in no case is there a sharp line of demarcation. Head comparatively flat. Abdomen shining black or dark grey. Lower margins of segments not white. . . . 4.
4. Somewhat large species (13-16mm.). Vertex with a tuft of black hairs behind the ocelligerous tubercle. Middle tibiae conspicuously pubescent. . . . . *tropicus* Linn.
— Slightly smaller species (11-15mm.). Vertex without a tuft of

black hairs. Middle tibiae with or without conspicuous pubescence. . . . . 5.

5. Abdomen conspicuously shining. Eyes touching for a comparatively short distance. Pubescence on eyes long and dark. Middle tibiae with long and abundant pubescence. Wings with cross veins clouded. . . . . *luridus* Fall.

— Abdomen only moderately shining. Eyes touching for a considerable distance. Pubescence on eyes short and pale. Middle tibiae moderately pubescent. Wings with cross veins not clouded. . . . . *montanus* Meig.

6. Upper eye facets only moderately enlarged being less than twice the size of the smaller facets, the change everywhere gradual and the sizes not abruptly contrasted anywhere. Pubescence on the eyes short brown. Somewhat larger species (13-17mm.) . . . . *distinguendus* Verr.

— Upper eye facets much enlarged, being quite 3 times the size of the smaller facets, and the sizes somewhat abruptly contrasted. Pubescence on the eyes long and pale. Somewhat smaller species (12-15mm.). . . . . *solstitialis* Meig.

Therioplectes micans Meigen.

T. micans Meig., 1804, Klass. u. Beschr., I. p. 167.
T. austriacus Fabr., 1805, Syst. Antl., p. 96.
T. signatus Panz., 1809, Fauna Germ., p. 110, pl. 20.
T. niger Donov., 1813, Nat. Hist. Brit. Ins., XVI. p. 47.

Male. Eyes in life greenish, with long pale pubescence, and with three purple bands. Frontal triangle shining black. Legs uniform black, the front legs with long upstanding bristly hairs on Nos. 1-4 tarsi; pubescence on femora dense black. Abdomen black, moderately shining, with dorsal median band of small whitish triangles, and (when viewed from behind) with faint grey side flecks as well.

Female. Superficially resembling the male, but eyes sometimes with four purple bands. Pubescence on eyes short and sparse. Frontal stripe broad, 2½-3 times as long as wide at the base. Frontal triangle shining black. Legs uniform black, pubescence on femora not so dense as in the male. Abdomen as in the male, but the side flecks more easily seen.

Length 13-17mm.

This species presents no difficulty in identification as it offers easily recognised characters which distinguish it at once from all other British species. A look out, however, should be maintained for *T. aterrimus* Meig. a common species in mountainous places on the Continent which has not yet been recorded from Britain, which bears a superficial resemblance to *T. micans*. In *T. aterrimus* the frontal triangle in the female is grey, and the male is without the conspicuous tarsal hairs of *T. micans* male.

T. micans is not a common species in Britain; it has, however, been recorded from the south coast to Inverness. It is (for Tabanidae) a very early species on the wing, May to June, and as Tabanidae rarely approach man except on fine hot days it is rather inclined to be missed on account of the inclement weather which often prevails in the late spring. Dr. F. H. Haines has taken it in numbers in the south Dorset marshes, and has a fine series, including males. In the British Museum collection there are specimens from the New Forest (May 29th-June 11th), and from Fordingbridge, Hants, June 11th, 1897, Col. Yerbury. Verrall records captures also from Merionethshire, Wales; Cumberland; Lancashire; and from Nethy Bridge, Inverness, Scotland. Mr. A. E. J. Carter (Entom. Mo. Mag., 1919, p. 233) records two females from Loch Voil, Perthshire, July 26th, 1919. Mr. J. W. Saunt has specimens labelled "Ryton Wood, Coventry, 6.vi.1922, F. Pepper," and "Brandon, Suff., 11.vi.1922, J.W.S."

According to Miss E. K. Pearce (Typical Flies, II., p. 11) the late F. C. Adams found *T. micans* to be "not common in the New Forest."

Surcouf (Tabanides de France, p. 102) states that freshly emerged specimens of *T. micans* have the shining frontal triangle obscured by a fine greyish yellow dust, which is soon lost when the insect takes to flight.

Variation.—The species shows little variation, but Surcouf states that the third antennal segment is sometimes reddish instead of black.

Therioplectes luridus Fallen.

T. luridus Fall., 1817, Diptera Suecica, p. 5, 4.
T. borealis Zett., 1842, Dipt. Scand., I.
T. depressus Walk., 1848, List Dipt. Brit. Mus., I., p. 167.
T. punctifrons Wahlbg., 1848, Oefv. Vet. Akad. Förh., IX., p. 200.

Male. Eyes in life greenish with three purple bands. Head not large, somewhat flat. Pubescence on the eyes long dense blackish brown. Frontal triangle silvery grey. Legs mainly blackish, the tibiae partly brownish orange. Femora with an abundance of black pubescence. Abdomen conspicuously shining black with reddish orange side-coloration on segments 2-3.

Female. Superficially resembling the male. Eyes in life greenish with three purple bands. Pubescence on the eyes dense dark brown, but shorter than in the male. Frontal triangle shining black. Frontal stripe about 3½ times as long as wide at the base. Legs blackish, the tibiae conspicuously orange red; pubescence on the front femora black, on the hind femora greyish. Abdomen shining black, the reddish side coloration not quite so extensive as in the male.

Length 11·5-16·0mm.

The species is probably not found in Britain south of Scotland. It was first taken in Britain by Col. Yerbury, at Nethy Bridge, Inverness, June, 1900 (Entom. Mo. Mag., 1902, p. 110), and has also occurred at Brodie, Nairn, and probably in Sutherlandshire and Dumfries.

In the Entom. Mo. Mag. for 1903, pp. 38-39, Mr. H. W. Andrews recorded the capture of a male *T. luridus* Fall. at Chattenden Wood, Kent, identification confirmed by Major E. E. Austen. Mr. Andrews informs me, however, that it was subsequently decided by Mr. Verrall and others that the specimen was a somewhat aberrant male of *T. tropicus* Linn.

Variation.

The only variation of note in this species is in the amount of reddish side coloration to the abdomen, especially in the female.

Therioplectes borealis Meigen, *partim* Loew.

T. borealis Meig., 1820, Syst. Beschr., II. p. 37.

T. borealis Loew, 1858, Verh. der Zool. Bot. Ges. Wien, VIII. p. 586.

Male. Eyes in life dark bluish green, with three reddish brown bands, the upper one faint and weak. Pubescence on the eyes short and whitish. Head hemispherical. Upper enlarged eye facets sharply separated from the lower. Abdomen shining black, with distinct whitish hind margins to segments; segments 1 and 2 with subdued chestnut brown black haired side spots, segment 2 with traces only of a grey middle triangle. Wings brownish. Tibiae brownish, front tibiae with apical half blackish; femora blackish. Antennae first segment grey dusted, second yellowish brown, third reddish yellow with distinct dorsal hump. Palpi appearing blackish, end segment somewhat ovate.

Female. Eyes in life green with 3 purple bands; pubescence on the eyes short and whitish. Frontal stripe broad, only 2½ to 3 times as long as broad at the base. Frontal triangle light grey. Lower callus large and quadrate, almost reaching to the eye margins. Abdomen broad; shining black, segments 1-2 with large dark brown side spots, hind margins of segments clearly white.

Length 13·0-15·0mm.

This species was added to the British List in 1906 by Major E. E. Austen (British Bloodsucking Flies, p. 38) from a male specimen taken by Mr. W. R. O. Grant at Glen Avon, Banffshire, June 8th, 1893. Verrall, however (British Flies, V. p. 366), considered the specimen to be only *T. montanus* Meig., and he omitted the species from his tables.

When examining Tabanidae in the British collections of the Hope

Dept., Oxford, recently, I was astonished to find a female specimen under the name of "*Tabanus anthracinus*." The specimen bore no locality or date, but carried two labels reading as follows :—

(i) *micans* named by Mr. Walker, 26.x.'68.

(ii) *Tabanus anthracinus* Meig. det. in coll. Ent. Club inst'd. 1826, pres. 1927 by Club to Hope Dept.

I carefully examined this specimen and in my opinion it is *Therioplectes borealis* Meig.

The finding of this specimen is most interesting, as on p. 760, British Flies, V., Verrall wrote under *Atylotus anthracinus* Meig.

"This is a species limited to South Europe and North Africa, and consequently Walker's *T. anthracinus* (Ins. Brit., Dipt., I. p. 37) must refer to some other species; he (*i.e.* Walker) said—Rare; in coll. of Ent. Club (E)—but I have been unable to trace any such specimen. I cannot distinguish Walker's description from specimens of *T. autumnalis*."

It is evident that I chanced to find the very specimen which could not be found for Mr. Verrall.

I shall doubtless be criticised for including this species in a work on British Tabanidae on the evidence of these two specimens only, but if its inclusion in my tables results in its being re-discovered by one of those fortunate entomologists who are able to collect in the Scottish Highlands I shall feel myself to have been justified.

Therioplectes tropicus Linné, *partim* Panzer.

T. tropicus Linn., 1761, Fauna Suecica, p. 463.
T. tropicus Panz., 1794, Fauna Germ., XIII., pl. 22.
T. paganus Fabr., 1775, Syst. Ent., p. 789, (?).
T. bimaculatus Macq., 1826, Recueil Soc. Agr. Lille.
T. luridus Loew, 1858, Verh. Zool. Bot. Wien, VIII., p. 526.
T. signatus Schin., 1862, Fauna Austriaca, Dipt., I., p. 29.
T. borealis Jaenn., 1866, Berl. Ent. Zeit., X., p. 69.
T. sacchalinensis Mats., 1911, Journ. Coll. Sapro, IV., p. 165.

Male.—Eyes in life with three purple bands, pubescence on the eyes pale velvety brown; eyes touching for about twice the length of the frontal triangle. Middle eye facets enlarged, but not conspicuously so and the change gradual. Head not large. Vertex with a conspicuous tuft of black hairs just behind the ocelli, curving forward. Side cheeks with black pubescence; frontal triangle whitish grey. Abdomen moderately shining black with extensive orange brown side coloration to segments 1-3, sometimes extended slightly to segments 5 or 6; the change from black to orange brown is rather sharply defined. Length 13-15mm.

Female.—Eyes in life green, with three purple bands, pubescence on the eyes pale as in the male. Frontal triangle silvery grey. Side cheeks with blackish pubescence. Frontal stripe silver grey or fulvous grey with more or less of black hairs, and with a conspicuous tuft of black hairs at the vertex, curving forward. Abdomen

blackish grey with lighter grey side spots and median triangles or spots which are frequently somewhat obscure and indefinite; sides of abdomen with or without reddish side coloration to segments 1 and 2, occasionally restricted to segment 2 and more rarely extended to segment 3. Palpi orange yellow with dense short black bristles; second joint broad at the base, but tapering to a very decided point. Legs blackish, the tibiae more or less reddish, middle tibiae all reddish. Length 13-17mm.

VARIATION.

The species, like the three which follow, is rather variable; in all probability the four species have a common origin, and their evolution is still in active progress. As a result the species are somewhat unstable and there is a noticeable tendency to form local races which, though profoundly interesting to the advanced student, are apt to be confusing to the novice. The fact that this local variation is frequently accompanied by variation in size tends to emphasise it rather than otherwise.

In the case of *T. tropicus* Mr. G. H. Verrall (British Flies, V., p. 771) refers to a race found by Col. Yerbury at Crymlyn Bog in Glamorganshire in July, 1908, which illustrates this point particularly well; and on pp. 359-360 he describes an extremely small specimen taken at Clifford's Castle in Herefordshire, also by Col. Yerbury, in August, 1902, which he found great difficulty in referring to *T. tropicus* at all.

T. tropicus has produced one well-marked form, however, which is sufficiently well differentiated to have aroused considerable discussion as to whether it has not attained specific status. This is the form *bisignatus* Jaenn., which is quite, or almost, without the reddish abdominal side coloration in the females. This is the prevailing form in at least the south of the British Isles, but not on the continent, though it is common in the environs of Paris.

The male of this form however, does not appear to have been separated satisfactorily, and I can only find that one male of Dr. Villeneuve has been doubtfully referred to this form. All the British males that I have seen have the reddish abdominal side colouring ending sharply with the lower margin of the third segment, and I personally incline to the view that these are the males of the form *bisignatus*, whilst those of typical *tropicus* (which is uncommon in this country) will I think be found to have the side colouring extended to at least the fourth segment. I have not seen any continental males, but I note that Surcouf (Tabanides de France, p. 110) describes the male of *tropicus* "les *quatres* premiers tergites jaune rouge en dessus avec une bande mediane noire."

The point requires study, and can only be satisfactorily settled by the taking of a long series of males from a locality (such as the New Forest, Hants) where both forms are known to occur. Unfortunately, this is always difficult with Tabanidae.

tropicus **tropicus** Linn.

Male.—As stated above I do not think this is well recognised in Britain, and I incline to the view that it will be found to have reddish side coloration down to at least the fourth abdominal segment. I have not yet seen a British specimen conforming to this description, but it would, of course, be as uncommon as the female, and, considering the very few males which exist in collections, may well have escaped notice in this country. Surcouf, in "Tabanides de France," p. 110 describes the male as having the first *four* segments of the abdomen yellowish red. Kroeber, in Lindner's "Die Fliegen der Pal. Region," avoids the point in his description.

Female.—Sides of abdominal segments 1 and 2 usually clear reddish brown, sometimes extending to segment 3. Frontal stripe silvery grey, underside of abdomen usually with indistinct reddish side coloration to basal segments. Length 13-15mm.

This form is uncommon in Britain. It occurs occasionally in the New Forest, where I took one female on June 9th, 1929, and Mr. H. W. Andrews 1 on June 12th, 1905. The latter has another specimen labelled Bedgebury Park Woods, July 9th, 1900. Verrall records it from Sussex, Kent, Surrey, Essex, Suffolk, Cambs., Worcs., Perth and Sutherland.

tropicus **bisignatus** Jaennicke, 1866, Berl. Entom. Zeitsch., X., Beitr. zu kennt. d. Tabaniden Europas, p. 67.

Male.—As stated above, I consider the male of this form to be that usually taken in this country, that is, it has bright clearly defined yellowish red side coloration to abdominal segments 1-3; in fact, the segments would be better described as being yellowish red with a black dorsal median band decreasing in width to nearly the lower margin of segment 3, but increasing again for the short remaining distance. Segments 4 and onward black, except for a slight whitish mark at the centre on the lower margin of each segment.

Female.—Reddish abdominal side colouring usually quite wanting, occasionally an isolated reddish spot appears on segment 2, with or without a faint reddish tinge on segment 1. Frontal stripe fulvous grey, underside of abdomen uniform grey, pubescence on middle tibiae long. Length 13-16mm.

The prevailing form in Britain, and found commonly in most low-lying woods and forests in the south and midlands. According to Verrall it is not nearly so common abroad, though abundant in the environs of Paris.

Therioplectes montanus Meigen.

T. montanus Meig., 1820, Syst. Beschr., II., p. 458.
T. tropicus Zett., 1838, Ins. Lapp., Dipt., p. 514. (p.p.)
T. braueri Villen., 1908, Bull. Soc. Ent. France, p. 276.

Male.—Eyes in life green with 3 purple bands (I have not seen

a male with less than 3 eye bands, but as females occur with 1 or 2 bands only, the student must be prepared to meet this same variation in the male sex). Pubescence on the eyes dense brownish grey. Middle eye facets enlarged, but not conspicuously so and the change nowhere sharply defined. Eyes touching for a long distance. Frontal triangle whitish yellow. No conspicuous tuft of black hairs at the vertex. Abdomen brownish black with dull reddish brown side coloration to segments 1-3, leaving a narrow blackish median band, with suggestions of small triangles on segments 2 to 4 ; indistinctly shining. End segment of palpi long and pointed. Third antennal segment reddish, the annulated tip blackish, and with a more pronounced dorsal hump than in the typical female.

Female.—Eyes in life a beautiful green, or blue-green, with from 1 to 3 purple bands. Pubescence on the eyes short and pale. Frontal triangle light greyish (unless rubbed). Frontal stripe greyish, about 3½ times as long as wide at the base. Lower frontal callus reaching to the eye margins on either side, usually of a roundish triangular shape but in some of my specimens it is more or less quadrate. Upper callus elongate ovate nearly or quite separated from lower callus. A few black hairs at the vertex, but nothing in the nature of a tuft as in the preceding species. Middle tibiae without long conspicuous pubescence. Third antennal segment normally blackish with but an indistinct dorsal hump, but in the form *fulvicornis* Meig., it has the basal part considerably reddish and the hump more pronounced.

Abdomen variable, greyish brown to brownish black with a darker dorsal median band and with brownish red side coloration varying from being quite obscure to occupying most or all of the sides of segments 1-3 or even 4, and then contrasting somewhat with the dark median dorsal band. Median triangles and/or sideflecks sometimes clearly discernible, sometimes more or less wanting.

Length 12.0-18.0mm.

Variation.

The species is extremely variable, particularly in the female sex. Besides the wide range of abdominal coloration referred to above, and the varying form of the lower callus, there is also variation in both the colouring and shape of the third antennal segment, and to a certain extent also in the end palpal segment as well.

The somewhat limited material that I have been able to examine, almost entirely from a single district (Aviemore and Nethy Bridge, Inverness), has made it impossible for me to carry the study of the variation exhibited by this species any further. Perhaps some other author able to collect extensively in the Scottish Highlands, and in the mountainous districts in other parts of the British Isles, will get together the amount and variety of material which is an essential preliminary to the tackling of this subject.

One form has been described on the Continent:—

montanus **fulvicornis** Meigen (1820, Syst. Beschr., II. p. 46).

Male.—(after Surcouf). Similar to *T. montanus* Meig., but the 3rd antennal segment more reddish on the basal half, and the notopleural callus sometimes black instead of reddish.

Female.—Generally similar to typical *montanus* Meig., but the 3rd antennal segment more reddish on its basal half, and wider with a more pronounced dorsal hump. Sometimes the reddish coloration extends to antennal segments 2 and 1. Length 14·5-16mm.

Some of the Nethy Bridge specimens I possess or have seen appear to be referable to this form, or to be intermediates between *fulvicornis* and typical *montanus*.

The species appears to be quite common in the Scottish Highlands, and in a number of places in the mountainous districts of S. W. Ireland. It has also been taken in Glamorganshire, at Crymlyn Bog, July 24th, 1908, Col. Yerbury (Verrall, Brit. Flies V., p. 771); a single female by Mr. H. Tetley near Baslow, Derbyshire (Entom. Mo. Mag., 1924, p. 213); and one ♀ at Fingle Bridge, Dartmoor, Devon, by Mr. H. J. Falkner, June 19th, 1930.

Therioplectes distinguendus Verrall.

T. distinguendus Verr., 1909, Brit. Flies, V., p. 371.

T. tropicus Walker, 1851, Ins. Brit., Dipt. I., p. 39. (?) (n. praeocc).

A common and widely distributed species of medium size which is usually easily recognised by its extensive reddish abdominal side coloration extending to segment 4, and soft yellow pubescence.

Female.—Eyes in life brownish green with three purple bands; pubescence on the eyes dark brown, short, dense in front and middle, sparse near the eye margins. Frontal triangle pale grey. Frontal stripe yellowish brown, about six times as long as wide at the base; lower callus shining black, roughly quadrate and not quite reaching to the eye margins; middle callus elongate, spear-shaped, and joined to lower callus by a thin line. (Plate II., fig. 22). Some black pubescence on the frons, and some longer forward curved black hairs at the vertex.

Abdomen with segments 1-4 reddish orange, remainder blackish, with a black dorsal band of varying width carrying vaguely defined isosceles triangles of pale pubescence. (Plate II., fig. 18). Lower margins of segments with a pale yellowish fringe. The reddish orange abdominal side coloration is covered with a soft yellow pubescence, and is usually free from black hairs or spots; specimens occur, however, with black pubescence or side spots to segments 3 and 4, rarely even more extensive, and these are sometimes difficult to distinguish from the next species (*T. solstitialis* Meig.) except in size.

Male.—Generally similar to the female, except for the more pointed abdomen, but the blackish hairs or side spots to the upper abdominal segments more frequent and more conspicuous. Brownish pubescence on the eyes short and dense; middle eye facets enlarged, nearly twice as large as the smaller facets, but not abruptly contrasted anywhere.

Length 13.0-15.5mm.

The species is common and widely distributed in Britain from the South Coast to Scotland and is on the wing from June to August or even to September.

VARIATION.

The bulk of the specimens met with do not display striking variation though specimens from different parts of the country have a noticeably different facies; the width of the black dorsal band varies somewhat, and the sides of abdominal segments 3 and 4 occasionally bear blackish pubescence as noted above. This latter seems to occur most often in northern latitudes though not entirely so. A specimen taken by Mr. P. Harwood at Aviemore, Inverness, in July 1925, and now in Mr. H. W. Andrews' collection has segments 3 and 4, and the lower corners of segment 2 predominatingly black, but with conspicuous yellow pubescence even on the black parts. The black dorsal band is also very wide. Specimens are, however, occasionally met with which have a distinctly different facies, and which I somewhat doubtfully treat as forms of this species, pending the acquisition of the material necessary properly to investigate their status.

distinguendus **rufus**, form. nov.

Mr. H. W. Andrews has sent me 3 females taken by Mr. P. Harwood at Nethy Bridge, Inverness, July 11th, 1925, which have a darker and very distinct appearance, and Mr. B. S. Harwood has a number of others. The reddish abdominal side coloration is distinctly darker, and is barely to be seen on segment 4. The shape of the abdomen is also different, the segments being progressively wider down to segments 3 and 4 which are quite 1½ times as wide as the thorax, thence narrowing rapidly; hence the general appearance of the abdomen is pear-shaped (Plate II. Fig. 19) in contrast to the elongate oblong almost parrallel-sided abdomen of typical *distinguendus*. (Plate II. Fig. 18). The lower frontal callus is also different, being more bell-shaped than quadrate. (Plate II. Fig. 23). The specimens are on the large side, the black dorsal band narrows towards the lower margins of segments 2 and 3, and in each is almost devoid of markings (my specimens *may* be rubbed), and the pale fringes to the lower margins of the abdominal segments are much less obvious. Soft yellow pubescence can, however, be seen on even the almost black sides of the 4th abdominal segment though it is not so abundant. At the moment of going to

press I have heard from Mr. J. E. Collin that he has a male, also from Nethy Bridge, of a rather distinct form. I think it not unlikely that we have a new species here, and entomologists who visit the Scottish Highlands in this and succeeding years should look out for it.

distinguendus **parvus**, form. nov.

I have in all some 10 females from various places in the New Forest, Hants, which are remarkably intermediate between this species and the next (*T. solstitialis*). They are distinctly smaller in size, four, in fact, being smaller than any of my specimens of *solstitialis*, and have a narrower abdomen which appears to be narrower in proportion to its length than in *distinguendus*. The reddish abdominal side coloration is seen in series to be of a different shade, being slightly less red with a suggestion of an olive tint*. Spots of blackish pubescence are present on at least segment 4, and in most cases on segment 3 as well (Plate II. Fig. 20); but there is in all cases some reddish coloration on segment 4, as well as some yellowish pubescence. The reddish coloration, though appearing paler than in typical *distinguendus*, is clearly darker than in *solstitialis*. The lower frontal callus is distinctly bell-shaped, and is thus intermediate between *distinguendus* and *solstitialis*. (Plate II. Fig. 25). The palpi are a trifle thinner and more pointed.

It seems very difficult to refer this rather distinct form to *distinguendus*, but it is equally, if not more, difficult to refer them to the next species, although they are much nearer the latter in size and general appearance. As the specimens run down to *distinguendus* in the Table I have dealt with them here.

Verrall (Brit. Flies. V. p. 380) noticed this form, when dealing with *T. solstitialis*, his specimens having been taken by Col. Yerbury at Kenmare, and Glengariff, Co. Kerry, So. Ireland; he appears, however, to have had 1 ♀ from Herefordshire (Leech Pool).

With the latter a male was taken which Mr. Verrall noted to be a little different from his only other British male (of *T. solstitialis*), the latter agreeing with continental specimens. The Herefordshire male appears to have had the enlargement of the eye facets and the extent of contrast between the two sizes intermediate between *distinguendus* and *solstitialis*, and I think it not improbable that this specimen is a male of the present female form. I have not, however, seen the specimen.

Surcouf (Tabanides de France, p. 119) notes that *T. solstitialis* Meigen, 1820, and *T. solstitialis* Schiner, 1862, do not exactly agree, and both he and Kroeber (Lindner, Die Fliegen der Pal. Reg., Tabanidae, p. 70.) refer the species to Schiner, not to Meigen. I have

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*One small female has this olive brown tint so marked that I thought at first that I had taken *T. montanus* Meig.; it has some black pubescence on the sides of even abdominal segment 2. It much resembles the small brown form of *T. montanus* Meig.

not seen Meigen's type specimen of *solstitialis*, but Verrall considered that it was undoubtedly the next species, and noted that one or two details of Schiner's description suggested *T. distinguendus*. Is it possible that Schiner had this intermediate form before him when describing his *solstitialis* ?

I incline to the view that we shall ultimately have to accord specific rank to this rather distinct form, but nothing can be done until males are forthcoming, the usual stumbling block when dealing with Tabanidae. It has been suggested to me that they are hybrids ; but if so they are not intermediate in size, and most of them occurred in parts of the Forest where *solstitialis* does not, as far as I know, occur.

Therioplectes solstitialis Meigen.

T. solstitialis Meig., 1820, Syst. Beschr., II., p. 56.
T. solstitialis Schiner, 1862, Fauna Austr., Dipt., I., p. 30. (?).
(?) *T. sanguisorba* Harris, 1780, Expos. Brit. Ins., p. 28, pl. 7.

A slightly smaller species than *T. distinguendus* in which the colours are usually more sharply contrasted and the reddish coloration paler, thus resembling *T. tropicus* male. The female has no reddish coloration on abdominal segment 4.

Male.—Eyes in life dull green with three purple bands, the third sometimes rudimentary. Pubescence on the eyes longer and paler than in *T. distinguendus*. Middle eye facets enlarged, larger than in *distinguendus*, about three times the size of the smaller facets, the sizes somewhat contrasted, but the change not anywhere abrupt. Abdomen longer, narrower, and more tubular than in *distinguendus*, the dorsal black band narrowing down to the 4th segment. The abdomen more shining, and the reddish coloration paler, and more like that of *T. tropicus*.

Female.—Eyes in life bright green with three yellow-edged purple bands. Pubescence on the eyes longer, paler and more abundant than in *distinguendus*. Frontal stripe paler than in *distinguendus*, lower frontal callus somewhat triangular in shape, brownish rather than black ; middle callus almost linear. (Plate II., fig. 21). Abdomen generally resembling the male, but with no reddish side coloration after segment 3, and with some black hairs on the sides of segments 2 and 3. Length 13-15·5mm.

This species is not nearly so abundant in the British Isles as the preceding species, but there must be many unrecorded localities other than the few given by Verrall. The latter gives Chippenham Fen, Cambs, and Lyndhurst, Hants. I have taken it myself on Rhinefield Walk, Brockenhurst, Hants, and Mr. H. W. Andrews has a series from Sutton Broad, Norfolk. Col. Yerbury (Trans. Devon Assn. for Adv. of Sc., 1920, p. 350) records it from Walkham Abbey, Devon, July 21st, 1889 ; and Rev. A. Thornley (Jnl. Royal

Instn. of Corn., 1929, p. 102) records 2 specimens by Rollason near Idless, Corn., July 8th, 1910. Mr. J. W. Saunt has 1 ♀ labelled simply "New Forest, 1903." Mr. E. E. Green took 1 ♂ at Camberley, Surrey, July 16th, 1924. Published records of the capture of this species are much needed.

VARIATION.

Unless the form *parvus* to which I have referred under *T. distinguendus* is found to belong here, this species cannot be said to vary to any large extent. Specimens occur with the reddish abdominal side coloration reduced so that on segments 2 and 3 only reddish spots are left. Mr. H. W. Andrews has two such specimens from Sutton Broad, and Surcouf refers to their existence without giving any data.

The New Forest specimens appear to be slightly larger and paler and to have less black pubescence on the sides of abdominal segments 2 to 4 than do those from Sutton Broad.

GENUS ATYLOTUS Osten Sacken.

Atylotus Ost. Sac., 1876, Mem. Boston Soc. Nat. Hist., II., p. 426.
Brachytomus Costa, 1857, Giamb. Vico Napoli, II., p. 445. (n. praeocc. in Mollusca, 1840).
Ochrops Szilady, 1915, Entom. Mitteil., IV., p. 93.

Genotype *Atylotus bicolor* Wiedemann.

Eyes in life a beautiful yellow or green, becoming more or less purplish when dried; usually unbanded, but a single band occasionally present; frequently with peculiar shifting spots which move as the insect is turned in relation to the source of light. Eyes hairy, or apparently bare, some females having a very fine and sparse eye pubescence which is not easily seen. Ocelligerous tubercle and ocelli wanting from the apex of frons, and (in the British species) the upper and lower frontal calli of the females, so conspicuous in the previous genera, reduced to rudimentary proportions or apparently absent altogether. Head rather large, especially in the males, but the size of the head somewhat variable; back of the head usually distinctly concave. Abdomen, and sometimes the thorax, densely covered with short pubescence or dust, yellow or grey predominating, which causes the species to have a soft mealy appearance. Wings with yellowish brown veins, and vein R_4 usually with a recurrent veinlet (usually absent in *A. plebejus* Fall.)

Enderlein (Mitt. Zool. Soc. Berl., XLII., p. 347, 1925) has used this character of the presence or absence of a recurrent veinlet to R_4 to subdivide this genus; he restricts *Atylotus* Ost. Sac. to those species which, like the genotype *A. bicolor* Wied., are without this

veinlet, and he erects *Dasystypia* Enderl., with type *Dasystypia rustica* Linn. (=the *Atylotus rusticus* Linn. of this paper) for the species with the recurrent veinlet. This character is, however, in my judgment, an unreliable one, and I do not feel that I can accord more than sub-generic rank to *Dasystypia* Enderl.

TABLE OF SPECIES OF *ATYLOTUS* OSTEN SACKEN.

1. Wing vein R_4 usually without a recurrent veinlet; abdomen with somewhat long greyish pubescence, and usually with some reddish side coloration to segments 1 and 2. (=*Atylotus* Ost. Sac. *sensu* Enderlein). . . . . . . *plebejus* Fallen.

— Wing vein R_4 usually with a recurrent veinlet; abdomen with shorter pubescence, grey, or more or less golden yellow coloured, with or without a blackish band or bands. (=subgenus *Dasystypia* Enderl.). . . . . 2.

2. Abdomen yellowish gold or brownish gold coloured, with a more or less indistinct broad darker median dorsal band. In life appearing a brilliant golden yellow species. . . . . *fulvus* Meigen.

— Abdomen brownish yellow or greyish brown with two dark dorsal bands separated by a broad ashy grey stripe. . . 3.

3. Abdominal blackish stripes not indented on the outside at the upper margins of segments (this character is best seen with the insect's head towards one). Femora yellow at the tips only. Greyish brown species. Frontal stripe of the female narrow and parallel sided. . . . . *rusticus* Linn.

— Abdominal blackish stripes indented on the outside at the upper margins of segments by the reddish side colouring. Femora with the apical half yellowish. Brownish yellow species. Frontal stripe of the female broader and not parallel sided. . . . *latistriatus* Brauer.

As in the previous genera the males have the eyes touching and the abdomen tapering to a pointed tip, whereas the females have the eyes well separated and the tip of the abdomen rounded.

Atylotus plebejus Fallen.

A. plebejus Fall., 1817, Dipt. Suec., Tab., p. 8.
A. laniger Wied., 1820, in litt. apud Meigen.
A. lunaticornis Zett., 1842, Dipt. Scand., I. p. 118.

A rather small mouse-grey species, usually without a recurrent veinlet to R_4.

Male.—Eyes in life yellowish; pubescence on the eyes whitish. Eye facets of the upper three-fourths of the eyes considerably enlarged, with a band at the line of division. Frontal triangle pale grey; vertical space brown, rather large, and with a tuft of black hairs at the vertex forward inclined. Back of the head with long

and distinct pubescence. Thorax with rather long whitish to greyish pubescence. Abdomen mouse grey, pubescent, segments 1-3, or 2-3, with more or less indistinct reddish side coloration, and a blackish dorsal median band interrupted at the lower margins of segments by a pale fringe. Femora blackish, tibiae yellow.

Female.—Eyes with one band, pubescence on the eyes rather short; frontal stripe darkish grey, about 4 times as long as wide at the base. Lower frontal callus very small, upper callus dusted over; hairs at vertex shorter than in the male. Abdomen with reddish side coloration to segment 2 only, or not at all. Thorax shorter haired than in the male. Legs as in the male, or even paler. Otherwise generally similar to the male.

Length 9·5-11·0mm.

Although Verrall stated that this species would probably occur with us (Brit. Flies, V. p. 381) I had not seen a published report of its capture; I was, therefore, agreeably surprised to find specimens in the British Museum collection taken by Mr. H. Womersley in Cheshire and labelled "Delamere Forest, July 15th, 1911," and "Abbott's Moss, July 22nd, 1911," respectively. The species must surely occur elsewhere in the British Isles.

VARIATION.

There does not seem to be any variation of a striking character in this species. The amount of reddish abdominal coloration, never large, varies as stated above, and a recurrent veinlet is occasionally present to vein R_4. Lundbeck (Dipt. Danica, I. p. 122) mentions a specimen with a distinct veinlet on one side, and a small one only on the other. Kroeber had, apparently, also seen specimens with a recurrent veinlet, for in the section on Tabanidae in Lindner's "Die Fliegen der Pal. Region," he uses the expression "recurrent veinlet *generally* wanting." One named form has been described on the Continent.

plebejus **aethereus** Bigot, 1862, Mem. Soc. Zool. France, V., p. 637.

This is a form of the male which differs from the type only in having the back of the head without long and distinct pubescence, and the abdominal side coloration extended over segments 1-4. Described from Germany and Upper Austria.

Atylotus fulvus Meigen.

A. fulvus Meig., 1820, Syst. Beschr., II., p. 61.
(?) *A. ferus* Scopoli, 1763, Ent. Carn., p. 371.
(?) *A. sanguisorba* Harr., 1780-2 Expos. Brit. Ins., p. 28, pl. 7.
(?) *A. alpinus* Schrk., 1798, Fauna Boica, III., p. 2534.
A. bituberculatus Bigot, 1892, Mem. Zool. Soc. France, V., p. 659.

The name *fulvus* Meig. is generally accepted by present-day entomologists as the first published name for this species which

can be identified with certainty. A glance at the synonymy above, however, will show that three doubtful names have priority, and there is always the chance that one of these may be brought forward with sufficient evidence to justify its acceptance as the earliest valid name.

A. fulvus is easily recognised by its golden yellow colour with a wide indefinite darker dorsal median band which is hardly visible in very fresh specimens.

Male.—Head rather large, considerably wider than the thorax, and much arched. Eyes in life a beautiful opalescent green, purple when dry, generally unbanded, and touching for a considerable distance; pubescence on the eyes dense brownish. The facets of the upper two-thirds of the eyes much enlarged and sharply separated from the lower ones. Vertical space brown. Antennae bright reddish. Thorax with dense golden pubescence. Wings hyaline, nervures yellowish, R_4 usually with a recurrent veinlet. Abdomen densely covered with golden pubescence, with some black hairs intermixed, but black if denuded; a fairly broad darker median dorsal band showing through, except in very fresh specimens. Legs mainly orange, the femora black basally, and the front tibiae black at the tarsal end.

Female.—Head smaller than in the male, eyes apparently bare or with very short pubescence; usually unbanded, but with dark spots or reflections which move as the insect is turned in relation to the source of light. Frontal stripe yellowish brown, about 4 times as long as wide and almost parallel-sided. Frontal calli almost obscured by the yellow dust, but usually visible as two small black dots connected by a thin line or furrow. Antennae bright reddish, the dorsal hump on segment 3 placed near the base. Thorax and abdomen as in the male, but more orange. Legs almost as in the male.

Length 12·5 to 15·0mm.

A. fulvus is widely spread in Britain, but can hardly be called common. It occurs fairly frequently in most parts of the New Forest, and has been recorded from most of the southern and midland counties where there are extensive old bogs. It is a beautiful species, the eyes especially so. The males are usually taken by sweeping herbage on the margins of bogs, or are found on flowers.

Variation.

As stated above the median dorsal band is more noticeable in some specimens than in others. In one freshly-emerged female specimen that I took at Matley Bog, New Forest, July 12th, 1930, the dorsal band was quite invisible and the abdomen more pointed as in the males. I have referred to this point in the introduction, where I stated that, in my opinion, such specimens are those which have not paired.

The size and shape of the head of the female seems to vary somewhat, and I have two specimens which have nearly black antennae, but which are otherwise quite typical.

Three forms have been described on the Continent, none of which is known to occur here:

(1) *fulvus* **loewianus** Villeneuve, 1920, Ann. Soc. Ent. Belg., LX., p. 65. A form from S. France with reddish orange abdomen in ♂ and with more pubescent eyes in ♀.

(2) *fulvus* **rufipes** Meigen, 1820, Syst. Beschr., II., p. 59. A more extreme form from S. Europe with femora all reddish yellow.

(3) *fulvus* **flavifemur** Enderl., 1925, Mitt. Zool. Mus. Berlin, XI., Bd. 2, p. 371. Described from a S. German specimen in Loew's collection, but I cannot distinguish it by the description from *fulvus rufipes.*

Atylotus rusticus Linné.

A. rusticus Linn., 1767, Syst. Nat., XII., 2, 1000, 11.
(?) *A. ruralis* Zett., 1838, Ins. Lappon., Dipt., p. 517.
(?) *A. flaviceps* Zett., 1842, Dipt., Scand., I., p. 111.

A smaller greyer species than *A. fulvus*, with two dorsal median slightly bowed black bands on the abdomen.

Male.—Head large, semi-globular, wider than the thorax. Eyes in life greenish, with or without a narrow dark band; pubescence on the eyes dense yellowish. Upper eye facets enlarged, sharply separated from lower. Antennae reddish yellow, the dorsal hump on segment 3 placed near the middle. Abdomen brownish grey, the basal corners somewhat fulvous, bearing a broad greyish brown middle band, which in turn bears a moderately broad light grey dorsal band margined by darker narrow bands; the dark marginal bands are not indented at the front margins of segments. Legs with femora greyish, orange at the tip, tibiae orange, blackish at the tip, the front tibiae black for the apical half.

Female.—Eyes in life greenish, with or without a narrow band or spots, pubescence on the eyes very short and sparse. Frontal stripe about five times as long as wide, parallel-sided. Abdomen generally similar to that of the male, but with less fulvous colouring and the blackish stripes somewhat more bowed out. Legs as in the male.

Length 11·0 to 15·0mm.

This species has been observed but little in Britain, and appears, therefore, to be very rare with us. Most of the specimens taken have come from Sussex. Mr. J. H. A. Jenner took 1 male and 4 females at Glynde Road, near Lewes, Sussex, July-Sept., 1882, as recorded by Verrall, some of the specimens being in the British Museum collection. Verrall also recorded 1 female from Eastbourne, July, 1900; 2 females by C. C. Babington from Monks Wood, Hunts,

June 9th, 1828; and 2 females ex Stephens collection without data. Duncan (1837) recorded it as scarce in Scotland but common in Cambridgeshire, but I am unable to refer to captures in either place. It should, however, occur in Scotland, as the species is common in Denmark (Lundbeck) where *A. fulvus* is scarce. It has quite recently been taken on the borders of Hampshire and Dorset, Mr. B. S. Harwood having taken it at Parley Heath close to the county boundary, and Mr. H. W. Audcent took 1 ♀ near Brockenhurst, New Forest, August, 1920. It is stated to be on the wing from July to September, and to be therefore rather a late species, so that the capture in June, 1828, quoted above is unusually early, if not misquoted. Verrall refers the species to Fabricius, 1781, having apparently overlooked the name in Edition XII of Linnaeus' "Systema Naturae."

VARIATION.

Verrall notes that the few British specimens seen by him varied but little, but that more variation had been noted abroad. Three forms are referred to in continental literature, none apparently occurring in the British Isles.

(1) *rusticus* **parallelifrons** Szilady, 1923, Biol. Hung., I., p. 11. A form from Siberia with grey femora and golden side flecked abdomen.

(2) *rusticus* **niger** Enderlein, 1925, Mitt. Zool. Mus. Berlin, XI., Bd. 2, pp. 370-1. A dark robust form from S. Russia.

(3) *rusticus* (form unnamed). Kroeber (in Lindner, Die Fliegen der Pal. Reg.). A fulvous form described without data as to captures.

Atylotus latistriatus Brauer.

A. latistriatus Brau., 1880, Densk. Akad. Wiss. Wien, XLII., p. 170.

(?) *A. flaviceps* Zett., 1842, Dipt. Scand., I., p. 111.

A species somewhat intermediate between *A. rusticus* and *A. fulvus*, easily confused with the former, but with a darker and more brownish yellow appearance. Unlikely to be found far from the sea coast.

Male.—Very like *A. rusticus* male, but the abdomen narrower and more pointed. Thorax and scutellum more shining. Pubescence on the eyes darker grey. Antennae dull reddish, the apical half dark brown, the dorsal hump less prominent and placed well before the middle. Abdomen with more fulvous basal side coloration, and with the dark median bands dentate on the outsides at the upper margins of each segment. Femora greyish, the apical half orange.

Female.—Also rather like *A. rusticus* female, but with a darker and more fulvous general appearance. Eyes in life greenish, almost bare, with a rather weak crossband, and with spots which move as the insect is turned in relation to the source of light. Frontal

stripe about $3\frac{1}{2}$ times as long as wide at the base, slightly contracting. Frontal calli shining black, small, isolated, the upper slightly the larger. Thorax blackish brown, moderately shining. Abdomen: segments 1 to 3 with a broad blackish dorsal median band and reddish sides, remaining segments blackish with obscure greyish side flecks, the blackish dorsal band bearing a narrower and paler band. Outer sides of the black median band indented at the upper margins of each of segments 1 to 3 by the reddish side coloration. Femora with the apical half reddish, the front femora blackish only at the base.

Length 11·5-13mm.

This species has been but little observed in Britain, and was first recognised by Verrall from a specimen taken by Col. J. W. Yerbury at Arne, Dorset, Aug. 26th, 1906. It appears to be a coastal or saltmarsh species, and may be expected in places where old and extensive marshlands are found in close proximity to salt water. Poole harbour in Dorset provides an abundance of such terrain, and the species is by no means uncommon there, though extremely local. Mr. H. W. Andrews has a specimen labelled "Colchester, Harwood," and Verrall records that Col. Yerbury found the species in some numbers near Walton-on-the-Naze, Essex, and noticed them attacking sheep. Major R. B. Robertson (Entom., 1919, p. 60) records the species from Oare and Faversham, Thames Marshes, Kent. The species will doubtless be found in other similar situations if looked for in mid-August on suitable days. It appears to be a late species, and I have not heard of a capture outside August.

One very pleasant duty remains to be discharged, and that is to try and suitably thank those whose assistance has alone made possible the completion of this work.

Firstly, I have to thank a number of colleagues, in most cases busily studying other Orders, who have yet found time to take and label specimens of Tabanidae which they felt would interest me; and it is surprising how many interesting specimens have come to me in this way. Messrs. B. N. Blood, A. Druitt, W. Fassnidge, J. A. Garner, E. Ernest Green, P. Harwood, E. T. Hayward, B. M. Hobby, F. J. Killington, J. P. Kryger, J. Park and A. H. Sperring have all helped me in this unselfish way.

Then I owe a special debt of gratitute to those dipterists who have lent or given me valuable specimens from their collections, and have thus unselfishly allowed me to use material which they had presumably collected for their own use. Messrs. H. W. Andrews, H. W. Audcent, J. E. Collin, H. J. Falkner, F. H. Haines, B. S. Harwood, H. P. Jones, J. W. Saunt and C. J. Wainwright have all helped me in this way. I must especially thank Mr. H. W. Andrews, who generously sent me the whole of his large and valuable collec-

tion of Tabanidae the moment he heard that I was working on this group, and Dr. F. H. Haines, who most kindly placed his large and valuable collection at my disposal, and allowed me to take away every specimen I wished.

I must not forget also the kindness of the authorities of the British Museum (Natural History); of the Hope Dept., University Museum, Oxford; and of the Public Museum, Nottingham, for allowing me full access to the valuable material in their care. I would particularly like to thank Professor E. B. Poulton, Hope Dept., Oxford, who most kindly opened the Museum on a closed day so as to make my visit possible.

Lastly, I have to express my deep and lasting indebtedness to Messrs. J. E. Collin, F. H. Haines, B. M. Hobby, and F. J. Killington for valuable opinions on nomenclatorial problems, and for much useful advice and information without which I could not have done.

I hope I have acknowledged all the help I have received; if any name has been omitted it will have been a pure oversight which none will regret more than myself.

I can hardly hope that there will be no mistakes at all, though every care has been taken to avoid such, and there will doubtless be omissions due to lack of material or knowledge on my part. I would welcome correspondence from any reader who may notice errors, or who can fill in any omissions that I perforce had to leave blank.

A SYNONYMIC LIST OF THE BRITISH TABANIDAE WITH THEIR NAMED FORMS OF THE PALAEARCTIC REGION.

Fam. TABANIDAE.
Sub-Fam. *SILVIINAE.*
CHRYSOPS Meig. 1800.
Heterochrysops Kröb. 1920.
Neochrysops Szil. 1922.

C. caecutiens Linn. 1761.
lugubris Linn. 1761.
maritimus Scop. 1763.
nubilosus Harr. 1780/2.
viduatus Fabr. 1794.
crudelis Wied. 1828.
f. niger Goffe. 1931.
f. nigrescens Goffe 1931.
t.f. caecutiens Linn. 1761.
f. obsolescens Goffe 1931.
f. meridionalis Strobl. 1906.
f. obsoletus Goffe 1931.
f. fulvus Goffe 1931.
f. clarus Goffe 1931.
f. hyalinatus Goffe 1931.
f. trifenestratus Kröb. 1920.

C. quadratus Meig. 1820.
viduatus Meig. 1804 (p.p.)
t.f. quadratus Meig. 1820.
f. intermedius Goffe 1931.
f. pictus Meig. 1820.

f. lineatus Goffe 1931.
f. obsoletus Goffe 1931.

C. relictus Meig. 1820.
caecutiens Panz. 1794 (pr.).
viduatus Meig. 1804 (p.p.).
f. inconspicuus Goffe 1931.
t.f. relictus Meig. 1820.
f. conspicuus Goffe 1931.
f. chlorosis Goffe 1931.
f. clarus Goffe 1931.

C. sepulcralis Fabr. 1794.

Sub-Fam. *CHRYSOZONINAE*
CHRYSOZONA Meig. 1800.
Haematopota Meig. 1803.

C. pluvialis Linn. 1761.
equorum Fabr. 1794.
hietomantis Schrk. 1803.
serpentina Wied. 1830.
hyentomantis Schin. 1862.
f. subcylindrica Pand. 1883.
f. hispanica Szil. 1923.
f. lusitanica Guér. 1844.
f. pseudolusitanica Sz. 1923.
t.f. pluvialis Linn. 1761.

C. crassicornis Wahlb. 1848.
americana Osten Sack. 1876.
f. tamerlani Szil. 1923.
t.f. crassicornis Wahlb. 1848.

C. bigoti Gobert 1881.
f. ocelligera Kröb. 1922.
f. monspellensis Vill. 1921.
t.f. bigoti Gob. 1881.

C. italica Meig. 1804.
elongata Le Pell. 1825.
gymnonota Brullé 1832.
tenuicornis Macq. 1834.
longicornis Macq. 1834.
f. nigricornis Gob. 1881.
f. variegata Fabr. 1805.
f. rotundata Szil. 1923.
f. grandis Macq. 1834.
t.f. italica Meig. 1804.

Sub-Fam. *TABANINAE.*
TABANUS Linn. 1761.

T. bovinus Linn. 1761 p. Loew. 1858.
T. sudeticus Zell. 1842.
f. meridionalis Goffe 1931.
t.f. sudeticus Zell. 1842.
f. perplexus Verr. 1909.
f. confusus Goffe 1931.
f. distinctus Goffe 1931.

T. autumnalis Linn. 1761.
bovinus Harr. 1780/2 (pr.).
auctumnalis Zell. 1842.
autumnatus Schrk. 1803.
f. brunnescens Szil. 1914.
t.f. autumnalis Linn. 1761.
f. molestans Becker 1913.

T. bromius Linn. 1761.
maculatus De Geer 1776.
nemoralis Meig. 1820.
scalaris Hoffgg. in Mg. 1820.
atricornis Meig. 1838 (p.p.).
bronnicus Gimm. 1847.
connexus Walk. 1850.
connexans Ric. 1905.
f. glaucus Meig. 1820.
f. flavofemoratus Strobl. 1908.
t.f. bromius Linn. 1761.

T. miki Brauer 1880.
graecus Meig. 1820 (pr.).

T. cordiger Wied., in Meig. 1820.
atricornis Meig. 1838 (p.p.).
latifrons Zett. 1842.
vicinus Egger 1859 (nec Meig.).
braueri Jaenn. 1866.
megacephalus Jaenn. 1866.

T. glaucopis Meig. 1820.
chlorophthalmus Meig. 1820.
ferrugineus Meig. 1804 (pp.) (nec Meig. 1820).
flavicans Zell. 1842.
f. cognatus Loew 1858.
f. castellanus Strobl. 1905.
t.f. glaucopis Meig. 1820.

T. maculicornis Zett. 1842.
glaucus Walk. 1850.
nigricans Egger. 1859.
glaucescens Schin. 1862.

Therioplectes Zell. 1842, *sensu* Brauer 1880.
Sziladynus Enderl. 1925.

Th. micans Meig. 1804.
austriacus Fabr. 1805.
signatus Panz. 1809.
niger Donov. 1813.

Th. luridus Fallen 1817.
borealis Zett. 1842.
depressus Walk. 1848.
punctifrons Wahlb. 1848.

Th. borealis Meig. 1820, p. Loew 1858.
f. bimaculatus End., 1925.

Th. tropicus Linn. 1761, p. Panz. 1794.
paganus Fabr. 1775 (?).
bimaculatus Macq. 1826.
luridus Loew 1858.
signatus Schin. 1862.
borealis Jaenn. 1866.
sacchalinensis Mats. 1911.
f. bisignatus Jaenn. 1866.
t.f. tropicus Linn. 1761.

Th. montanus Meig. 1820.
tropicus Zett. 1838.
braueri Villen. 1908.
f. fulvicornis Meig. 1820.
t.f. montanus Meig. 1820.

Th. distinguendus Verr. 1909.
tropicus Walk. 1850 (pr.).
f. rufus Goffe 1931.
f. parvus Goffe 1931.
t.f. distinguendus Verr. 1909.

Th. solstitialis Meig. 1820.
sanguisorba Harr. 1780/2 (?).

Atylotus Osten Sacken 1876.
Brachytomus Costa 1857 (pr.).
Ochrops Szil. 1915.

A. plebejus Fallen 1817.
laniger Wied. 1820.
lunaticornis Zett. 1842.
t.f. plebejus Fall. 1817.
f. aethereus Bigot 1892.

A. fulvus Meig. 1820.
ferus Scop. 1763 (?).
sanguisorba Harr. 1780/2 (?).
alpinus Schrk. 1798 (?).
bituberculatus Bigot 1892.
f. loewianus Villen. 1920.
f. rufipes Meig. 1820.
f. flavifemur Enderl. 1925.
t.f. fulvus Meig. 1820.

A. rusticus Linn. 1767.
ruralis Zett. 1838 (?).
flaviceps Zett. 1842 (?).
f. parallelifrons Sz. 1923.
f. niger Ender. 1925.
f. (un-named) Kröb. 1923.
t.f. rusticus Linn. 1767.

A. latistriatus Brauer 1880.
flaviceps Zett. 1842 (?).

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r_4
r_{2+3}
r_1
Sc
C
1.
r_5
m_1
m_2
m_3
Cu_1
Cu_2+1a
2a
r.v.
2
3.
4.
5.
6.
Vertex.
Spurs.
7.
8.
Base of Antenna.
9.
10.
11.

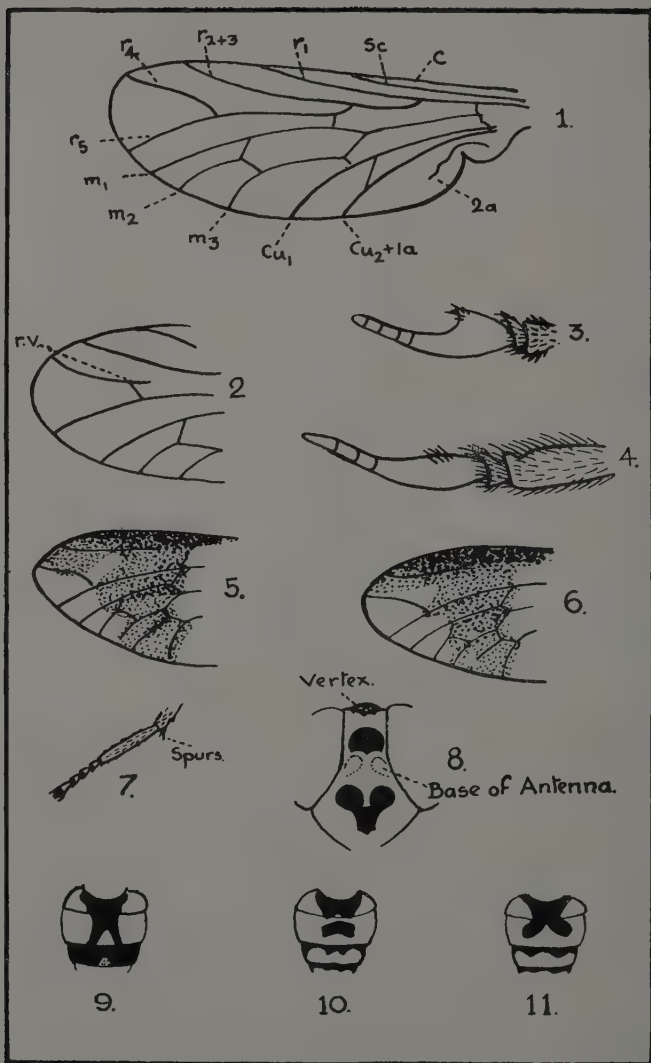



PLATE I.

Explanation of Plate.

Fig. 1.—Wing of *Tabanus* sp. showing typical venation.

" 2.—Tip of wing of *Atylotus* sp. showing a recurrent veinlet to R_4 (r.v.).

" 3.—Antenna of *Tabanus* sp.

" 4.— " *Chrysozona* sp.

" 5.—Tip of wing of *C. caecutiens* Linn. ♀.

" 6.— " " *C. sepulcralis* Fabr. ♀.

" 7.—Part of hind leg of *Chrysozona* sp. showing tibial spurs.

" 8.—Face of *C. caecutiens* Linn. ♀.

" 9.—Part of Abdomen of *C. caecutiens* Linn. ♀ (type form).

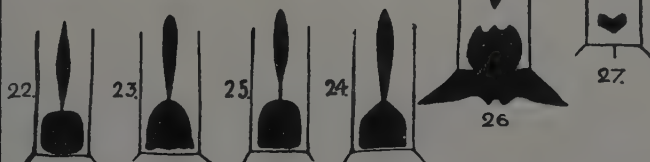
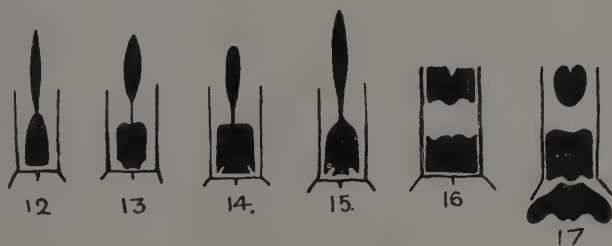
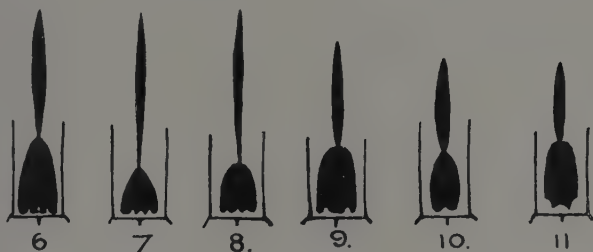
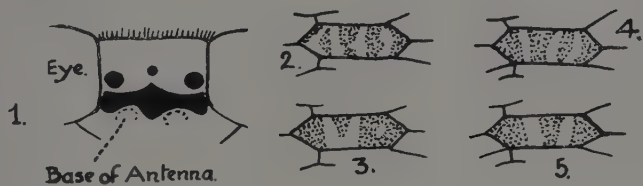
" 10.— " " *C. quadratus* Meig. form *intermedius*, n.f. ♀.

" 11.— " " *C. relictus* Meig. ♀ (type form).

Note.—In Fig. 1 the nomenclature of the wing veins is that used by Lindner in "Die Fliegen der Palaearktischen Region," 1925. According to recent researches of Tillyard and others the vein shown as Cu_1 is in reality M_4.

PLATE II.

Explanation of Plate.

Fig. 1.—Head of *Chrysozona pluvialis* Linn. ♀.
,, 2.—Discal cell wing markings of *C. pluvialis* Linn.
,, 3.— ,, ,, ,, *C. crassicornis* Wahlb.
,, 4.— ,, ,, ,, *C. italica* Meig.
,, 5.— ,, ,, ,, *C. bigoti* Gob.
,, 6.—Frontal Callus of *Tabanus bovinus* Linn. ♀.
,, 7.— ,, ,, *T. sudeticus sudeticus* Zell. ♀.
,, 8.— ,, ,, *T. sudeticus meridionalis* n.f. ♀.
,, 9.— ,, ,, *T. sudeticus perplexus* Verr. ♀.
,, 10.— ,, ,, *T. sudeticus confusus* n.f. ♀.
,, 11.— ,, ,, *T. sudeticus distinctus* n.f. ♀.
,, 12.— ,, ,, *T. autumnalis* Linn. ♀.
,, 13.— ,, ,, *T. miki* Brauer. ♀.
,, 14.— ,, ,, *T. bromius* Linn. ♀.
,, 15.— ,, ,, *T. maculicornis* Zett. ♀.
,, 16.— ,, ,, *T. cordiger* Wied. ♀.
,, 17.— ,, ,, *T. glaucopis* Meig. ♀
,, 18.—Abdomen (upper side, of *Th. distinguendus* Verr. ♀.
,, 19.— ,, ,, ,, *Th. distinguendus rufus* n.f. ♀.
,, 20.— ,, ,, ,, *Th. distinguendus parvus* n.f. ♀.
,, 21.— ,, ,, ,, *Th. solstitialis* Meig. ♀.
,, 22.—Frontal Callus of *Th. distinguendus* Verr. ♀.
,, 23.— ,, ,, ,, *Th. distinguendus rufus* n.f. ♀.
,, 24.— ,, ,, ,, *Th. solstitialis* Meig. ♀
,, 25.— ,, ,, ,, *Th. distinguendus parvus* n.f. ♀.
,, 26.— ,, ,, ,, Frontal stripe of *Th. micans* Meig. ♀ showing presence of an ocelligerous tubercle.
,, 27.—Frontal stripe of *Atylotus rusticus* Linn. ♀ showing reduced frontal calli and absence of ocelligerous tubercle.

Eye.
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Base of Antenna.
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LEUCANIA FAVICOLOR, Barrett.

A Life History compiled from the Notes of the late Eustace R. Bankes, M.A., F.E.S., and with Annotations by W. Parkinson Curtis, F.E.S.

Foreword :

Leucania favicolor Barrett is usually regarded as an aberration of *Leucania pallens* L. It is so treated by Staudinger and Rebel, Cat. Pal. Lep. Ed. II. Thiel I. No. 1935 (1901) but too much stress need not be laid upon a catalogue reference. F. N. Pierce however states [Gen. Brit. Noct. p. 27 (1909)] that the only difference he can detect in the genitalia is that *favicolor* is the larger. The range of *favicolor* appears to be limited and is not co-extensive with that of *pallens*, on the other hand *favicolor* is not known to occur in any area from which *pallens* is absent. It should however be remembered that the range of *pallens* is very extensive, *viz.*, Europe central north including Arctic region, France, Spain, Italy, Rumania south and east, Russia (south), Armenia, Siberia, Amur, Ussuri, North America. A local race of limited distribution would not therefore be anything very extraordinary.

These notes were made in July to October, 1904. They relate to two batches of ova received by Mr. Bankes from Paymaster-in-chief Gervase F. Mathew, R.N., and laid by a female taken in the Harwich District of Essex. The first batch were laid by a female of the beautiful red form, the second batch by a female of the forma typica.

Ovum. The ova were laid in crevices in a chip box formed by raising the wood here and there with the point of a knife. The shape is more or less decidedly spherical though extremely irregular, the surface being frequently flattened in parts, no doubt due to contact with the crevices in the chip box into which the female had forced the eggs with her ovipositor.

The colour when first received was a cream colour, later changing to pale buff with the black ocelli and red mouth parts of the larva showing through as conspicuous spots, later the ova turned to ochraceous buff and then to dark grey before hatching. The eggs are covered as are those of *Leucania vitellina* Bdv. with a sort of transparent film laid over them possibly as a protection against weather*. The eggs commenced hatching July 9th†. The cream

* Bankes has put in his notes " ? enemies " ; it is possible the transparent film protects the ova from proctotrypid parasites.

† Bankes gave no date of receipt so one cannot estimate length of time between oviposition and hatching. I do not know of any description of the eggs of *Leucania pallens* L. with which to compare the above. W. Buckler described the larva of *Leucania pallens*. E.M.M., III., p. 68 (1866).

colour of the ova was retained till shortly before hatching, when the colour changes took place with rapidity. Ova which had not changed colour by the evening of July 16th, had completely changed it by noon July 17th, and had hatched by 8 a.m., July 18th. The second batch of eggs, with few exceptions, hatched July 18th, the last to emerge being July 21st.

Larva. Length when hatched 2mm., very active, very strongly negatively phototropic, hiding in any small chink to escape daylight. Head very broad and rather flat, highly polished clay colour (Ridgeway)*. Upper mouth parts reddish. Thoracic plate polished concolorous with head or sometimes a little more grey.

Ocelli large, distinct, black. Thorax and abdomen together dirty watery-whitish with here and there a brown tint showing through the skin. Anal plate, legs and prolegs concolorous with thorax and abdomen. Under the anal plate an ill-defined grey spot shows through the skin. Hairs long, whitish. Ventral surface concolorous with dorsal. Warts very minute black. Skin smooth, rather shining.

The larvae on emergence ate about half the shell of the ovum.

The larvae were offered *Dactylis glomerata* L., cock's-foot grass. They took to it readily enough†. The result of commencing to feed is that the anterior half of the larva (which of course "loops" like a geometer in walking) soon becomes green, while the posterior half retains its previous colour; the former by the time of the first ecdysis is "French-green" (Ridgeway,) while in the latter the alimentary canal only shows through as a central dorsal French-green line. With the commencement of alimentation the skin assumes an extremely shiny and glassy appearance.

The larvae hide closely by day, but by night they roam about freely and actively over their cage and its contents, travelling at a great pace.‡

Their method of eating is to gnaw away all the green part of the grass blade wherever they attack it—most often, though by no means always, at or near the tip—leaving nothing but the colourless membrane and even this is often devoured leaving holes right through the leaf between the ribs. This occurs even during the first instar.

The larvae even in their first instar are also fond of eating the stout white lower parts of the stems of the grass which they gnaw

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* As far as I can make out Bankes used Ridgeway throughout these notes although he did not bracket "Ridgeway" after every colour mentioned. I know he had Oberthür's *Repertoire des Couleurs*, also.

† This is a foodplant of *L. pallens* (teste W. Buckler, *l.c.*) but it is possible that *L. favicolor* is quite as catholic in its tastes as *L. pallens.*

‡ I think this activity is probably in part due to confinement; most larvae tend to spread from their point of origin unless definitely gregarious, and since most Noctuae have cannabalistic propensities, it is probable that the spreading habit together with the activity with which to spread are necessary.

either from the outer surface or at any point where the stem is injured or broken.

The first instar lasted about six days, the first ecdysis being performed July 15th to 16th.

Second instar. Length 5mm. when stretched out. The colour of the larvae became very variable.

Head dirty ochreous dotted with black, highly polished.

Prothoracic plate polished, more or less concolorous with head but greyer in tone, varying in different individuals, but always of a much less decided colour than the head, dotted with black and divided down the centre by a pale line.

Thorax and abdomen at first dirty watery whitish and gradually becoming whitish buff as age advances; there is a tinge of grey as far as the posterior end of the second segment. The plain whitish buff may be tinged anteriorly with ochreous, or the whitish buff of the second thoracic and first and second abdominal segments may be strongly greenish grey or greyish green, and either greyish green or greenish grey posteriorly, *i.e.*, chiefly 3, 4, 5 and 6 of the abdominal segments, those posterior to this position being paler and of the unobscured ground colour. Whatever the general colour of the larva, the thoracic and first two abdominal segments are noticeably darker than those following them, the pale line of demarcation between them being very distinct.*

Anal plate is watery whitish dotted with black, and with very little polish, just in front of it is an ill-defined area where a large green spot shows through the semi-transparent skin. The effect of this spot is to make it look as if there were no anal plate.

Ocelli black distinct; warts minute black; hairs long whitish, skin smooth not shining.

Ventral surface watery whitish, the green of the internal vessels showing through especially anteriorly.

Legs watery whitish externally ringed black.

Prolegs watery whitish externally ringed black.

As the larva darkens in colour, there are traces of pale whitish dorsal, sub-dorsal and supra spiracular lines.

The most advanced larva completed its second ecdysis on July 20th.

Third instar.

Length 6mm. at rest.

Head and thoracic plate as in 2nd instar.

Thorax and abdomen somewhat variable in depth of colour,

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* I suggest the green colour is partly due to the chlorophyll of the food consumed being partly visible through the skin, which suggestion finds support in the fact that the segments which deal with the food residuum after digestion do not show this tone. This also was apparently Bankes's view, as he speaks of ground colour obscured by internal vessels. This hardly seems the right way to put it, I should prefer visually degraded by underlying colour.

rather darker than in 2nd instar, and anteriorly darker than posteriorly, light olive grey sometimes tinged with ochreous.

Dorsal, subdorsal and supra spiracular lines more visible than before, narrow dingy bluish white. Below the supra spiracular line the ground colour is noticeably darker, *i.e.*, greyer for the breadth of a stripe (the spiracles are on the lower edge of this stripe) extending down to the next line of black warts, immediately below which there is a very clear line of demarcation between the dark ground colour above and the dirty ochreous watery whitish colour of the ventral area.

Legs, claspers and anal plate as in 2nd instar.

At this stage the larvae were peculiarly fond of the stout white cut lower ends of the grass, often eating this in preference to the tender tips of the blades.

The more forward larvae completed their 3rd ecdysis on July 26th.

Fourth instar.

Length 7·5mm.

Head and thoracic plate as in 3rd instar.

Thorax and abdomen decidedly darker than in 3rd instar, dorsally and subdorsally greyish olive green anteriorly slightly darker and more green than posteriorly. All the lines as in 3rd instar, the broad dark stripe below the supra-spiracular line (which is ochreous whitish) is still conspicuous dark greyish olive green or tawny olive fuscous ; just below the supra spiracular and within the darker band is a row of black warts. The spiracles lie just inside the darker band, the lower edge of which is bounded by an ochreous-whitish subspiracular line, which is only a little whiter than the pale colour of the reddish white broad line next below it and bounding the ventral area.

Anal plate dirty water whitish dotted with black warts.

Legs and claspers as in 3rd instar.

Ventral surface as in 3rd instar, but partially tinged with olive green.

Bankes after this selected the two most forward larvae and fed them separately for greater accuracy of observation.

No. 1 performed its 4th ecdysis on August 2nd ; No. 2 on August 13th.

Fifth Instar.

Length 11mm. at rest.

Head as in instar 4.

Prothoracic plate variable, but now its ground colour is concolorous with that of the dorsal areas of thorax and abdomen, though it is rather polished and ochreous tinged ; it also shows the dorsal and subdorsal whitish lines dintinctly and has the ordinary black warts.

Thorax and abdomen continue to increase pigmentation and are dorsally and subdorsally rather pale tawny olive with the dorsal

area somewhat tinged with green along the centre, *i.e.*, on the dorsal line and on each side of it.

Dorsal and subdorsal lines dirty whitish as before, but without bluish tinge.

Legs, claspers and anal plate as before.

Ventral area dirty ochreous watery whitish.

The looping habit, and use of a thread of silk are abandoned during this instar.

Negative phototropism is more accentuated than before.

In this instar the ground colour is more distinctly broken up into lighter and darker longitudinal lines apart from the whitish lines already mentioned, and although the individual larvae vary in depth of colour there is distinctly noticeable, in the darker individuals, a very broad fuscous tawny olive darker line on each side of the pale dorsal line, and a narrower line of the same darker colour bordering the upper edge of the subdorsal line.

The fifth ecdysis of No. 1 control larva took place on August 12th ; of No. 2 on August 31st. Control No. 3 referred to below performed this ecdysis on September 8th.

Sixth Instar.

Length at rest 13·5mm.

Head and thoracic plate as in 5th instar.

By this time there are clearly marked on the head two distinct ill-defined slightly curved brownish longitudinal lines, one on either side of an imaginary central line. These are the most noticeable of the brownish markings and reticulations on the head*. They do not in some individuals extend as far forward as the mouth.

Thorax and abdomen dorsally and subdorsally with the ground colour, *viz.*, the palest stripes next to the whitish one) still pale tawny olive or in some individuals cinnamon-rufous and still strongly tinged with green along the dorsal line and the area near it, *i.e.*, along the darker broad line running on either side of the dorsal line.

Subdorsal, supra- and subspiracular lines whitish as before.

The darker stripes (except the still darker spiracular) are dark tawny olive in some and rufous burnt umber or dark chestnut in, other specimens.

Legs, claspers and anal plate as before.

The area just below the subspiracular line is now strongly tinged with red, this area having the appearance of a broad reddish white or whitish red band.

Ventral surface dirty watery whitish tinged with green.

Next below the subdorsal line is now seen a darker line (greenish fuscous), though not so well marked as the one bordering it above ;

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* This is the first time Bankes has noted any markings on the head other than black dots, his mode of expressing himself leads one to suppose that these markings only became progressively visible during the 6th instar.

then below this is a narrow line of the paler ground colour, and below this again another greenish fuscous line which borders the supra-spiracular line on its upper side. The broad dark spiracular band is still the darkest of all the dark lines.

As the larva gradually feeds on and grows between each moult it, of course, becomes paler and more tinged with green.

Bankes, at this instar, apparently added a 3rd control which was two instars behind No. 1 and one behind No. 2.

The ecdysis of No. 1 took place on August 29th, ; No. 2 on September 19th, and No. 3 on September 26th.

Seventh instar.

Length at rest 16mm.

Save for the silver spots referred to lower down, I fail to notice any change of importance, except that the ground colour is slightly darker and less tinged with rufous in two out of the three*. The dorsal line is now noticeably paler, whiter and rather broader on the first few segments than behind them.

It must be borne in mind that the spiracular broad stripe is always the darkest of all the stripes, while the dark stripes each side of the white dorsal line are the next darkest, being distinctly more fuscous than the other dark lines; this is so in all the later instars.

The larva is identical in appearance in instars 6, 7 and 8, save that it becomes generally progressively lighter, which lightening continues progressively until maturity.

The following is an analysis of the lighter and darker lines between the dorsal pale line and the ventral area. All the lines become progressively lighter as the larva advances toward maturity.

(1) Whitish dorsal narrow line.
(2) Broad dark mummy brown or greenish fuscous stripe showing signs of a narrow ill-defined line down its centre.
(3) Broad-line of pale sienna or in the rufous specimens pale cinnamon-rufous ground colour, which ground colour is now greatly obscured by the broad darker stripes, etc.
(4) A slightly narrower dark tawny olive or mummy brown or in the rufous specimens dark chestnut, or it might be called rufous burnt umber stripe.
(5) Narrow well-defined whitish subdorsal line.
(6) Narrow ill-defined line concolorous with No. 4.
(7) Narrow line of pale ground colour.
(8) Another narrow ill-defined line concolorous with No. 4.
(9) A rather well-defined narrow whitish supra-spiracular line.
(10) Broad spiracular fuscous or dark olive stripe.
(11) Narrow white subspiracular line.
(12) Broad reddish-white stripe adjoining the rather darker pale watery greenish white ventral area.

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*Bankes ascertained this to be due to the fact that his controls were respectively an instar ahead of the next No., so he was comparing the general colour of instars 5, 6 and 7.

It is at this stage necessary to observe that the greenish fuscous had encroached so much on the pale ground colour that the prevailing tone is dark, and it would be natural with a larva at this stage to say that the ground was greenish fuscous with paler lines on it.

At this instar there appears a remarkable character which, though inconspicuous in this instar, becomes more and more developed at each successive ecdysis; the intersegmental interstices are bounded both anteriorly and posteriorly by a chain of minute round burnished silver dots across the dorsal region extending on each side to the middle of the ground colour stripe next below the white subdorsal line. The posterior chain is broken in the middle, the broken ends on each side of the white subdorsal line being carried for a short distance obliquely backward on to the segment behind. These silver chains are much more noticeable on the abdominal segments, except near the anal extremity, than they are on the thorax. On most of the abdominal segments a few similar silver dots can be noticed near the centre on either side of the white dorsal line, most of these dots forming a short chain broken in the centre.

Control No. 1 performed its 7th ecdysis on September 16th; No. 2 on September 2nd, and No. 3 on October 19th.

The controls when selected were the most forward of the batch of larvae, but at this instar some of the other larvae, even those belonging to second batch of ova, were one and in some cases two instars ahead of the controls.

Eighth Instar.

No. 1 measured 18mm. when at rest.

This presents little change. The ground colour, *i.e.*, the paler lines (excluding the whitish lines) still vary considerably from pale cinnamon rufous or ochreous tawny to pale tawny olive or sienna buff and the colour of the darker stripes except the spiracular is tawny olive. The spiracular line fuscous or olive reticulated with buff. In this instar, No. 1 grew extremely rapidly outstripping 2 and 3: it also rapidly became lighter in colour, and on September 22nd was 26mm. when at rest, with the paler lines (exclusive of the whitish lines) buff, and the darker lines greenish tawny olive, markedly so anteriorly, hardly so posteriorly.

No. 1 did not at any time show the strong rufous colour of the controls Nos. 2 and 3. Nos. 2 and 3 when 26mm. became paler owing to the breaking up of the darker stripes with reticulations of buff. The broad dark stripe on each side of the whitish dorsal line notwithstanding this reticulation has the inner edge, except just behind the head, marked as a narrower dark tawny olive line stongly tinged with green anteriorly.

The broad spiracular stripe was, though still a somewhat darker brown posteriorly than the other dark stripes, becoming progressively paler owing to the reticulations of buff. The chains of silver dots have increased in visibility.

In No. 1 the yellowish whitish line, the broad dark spiracular stripe was but slightly and partially tinged with reddish which became less and less pronounced as the larva approached maturity. The underside remained watery whitish, tinged with greenish, especially anteriorly. In this, the penultimate instar, the larva resembles the full-fed larva except for its general darker appearance. However the larva when resting for its ultimate ecdysis is peculiarly pale, being buff in general colour, and this coloration to some extent pertains to the preceding instar.

On September 24th No. 1 was resting for its 8th ecdysis, which it performed on September 25th. No. 2 on October 4th; No. 3 on October 19th.

Ninth Instar.

Length 26mm. when at rest.

Description after recommencing feeding.

The head seems conspicuously broader than before, pale "Wood brown" Ridgeway, conspicuously reticulated with grey brown ("hair brown" Ridgeway) and with the two dark grey-brown prominent curved lines, mentioned before, on each side of the central line. The head has some minute scattered black warts each emitting a moderately long bright brown hair. Ocelli separate, black, distinct, antennae with basal half watery whitish and apical half ochreous whitish with a black ring at the joint.

Legs semi-transparent watery whitish showing black warts (each emitting a brown hair) towards the base, and with the claws maroon red.

Prothoracic segment concolorous with and showing everywhere the same markings and lines as the thoracic and abdominal segments; owing to this the presence of a prothoracic plate is only discernible by the fact that the plate is highly polished whilst the other parts of the prothorax and the other segments are dull. The larva is at this stage cylindrical with a slight tapering toward the anal extremity.

Dorsal line white, narrow except anteriorly, where it is of moderate breadth, conspicuously and rather broadly margined with black with speckling and reticulations on either side. Outside this black margin the pale ground colour*, which is at this stage usually some

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* Bankes notes that at this stage of development the predominance of colour has entirely changed. In the 7th instar he stated that the greenish fuscous had encroached so much on the pale ground that it would be natural to describe the larva as greenish-fuscous with paler lines on it. In this instar the selected areas of ground colour of tawny-olive forming the ground no longer predominated but the predominant colour was cream, buff, or yellow, and that it would at this stage be natural to say this was the ground and that it was primarily reticulated in tawny olive or raw umber and secondarily with jet black.

Uniformity demands that the coloured area selected for the ground colour should be retained throughout the description as the datum, ease of comparison, that the same area should be selected throughout all compared species. A great deal of unnecessary confusion has arisen through the failure of authors to define what the ground colour they are referring to really means.

shade of tawny-olive or raw umber (Ridgeway) either lighter or darker, is also for the breadth of a broadish stripe reticulated with cream, but with black reticulations overlying, the black reticulations being less heavy than those at the side of the dorsal line. In this stripe is situated a line of small black warts, each emitting a short brownish hair. Outside this is a rather broad stripe of the pale tawny-olive ground colour, with no black specklings or reticulations, but so thickly and heavily spotted and marked with cream colour as to be rendered very pale. Outside this pale stripe is a rather narrower one in which the tawny olive also heavily reticulated as well with black, this stripe encloses another line of similar black warts. Then follows the rather narrow white subdorsal line, also rather broader anteriorly. Then follows a broad stripe of the ground colour reticulated and marked with white along its centre, though less heavily marked with white than the cream marked stripe. above referred to, is with cream. Outside this follows a white line, narrow and less clearly defined than the dorsal and subdorsal ones, and below this is a broad stripe of light drab, slightly marked with cream colour here and there along its centre, heavily reticulated with black, especially near its margins. This broad stripe includes some black warts and situated on its lower margin are the elliptical white spiracles narrowly edged with black. The first (*i.e.*, the one on the prothorax), and the last (*i.e.*, on the 8th abdominal segment) are about twice as large as any of the other spiracles.

Below this broad stripe is a moderately broad cream coloured stripe marked and reticulated with pale coral red, which gradually fades away till in the full-fed larva it is replaced by greyish wood-brown. This line also includes some black warts emitting short brown hairs.

Below this follows what may be properly called the ventral area. Underside watery greyish whitish tinged with green and with some whitish reticulations towards the margins.

Anal plate hardly polished, light drab, marked with smoky fuscous and with some black warts emitting light brown hairs.

Claspers watery whitish externally clouded with fuscous (smoky brown) and with some black warts towards the base.

Skin dull, smooth, except for the ordinary cross wrinkles, though the markings give it a shagreened appearance.

The markings and lines are continued on the skin of the intersegmental divisions. The chains of silver burnished dots are now highly developed.

[The full-fed larvae vary but little, but the colour taken by Bankes as the original ground was always some shade either of raw umber or tawny-olive reticulated and broken up with the lighter.]

A larva, not a control, of the first batch of eggs buried itself

in the wet coconut fibre supplied in place of earth on September 26th.

No. 1 control ceased to feed on October 4th and went down. No. 2 on October 13th; No. 3 on October 28th.

When full-fed, the larva normally extended is 35mm. long and 5mm. broad.

The latest larvae lived on till December 11th, but it is doubtful if they pupated successfully.

When nearly full-fed the larvae were placed in a cage containing 2 inches of wet coconut fibre; in this they hid during the day, only coming out at night to feed.

Bankes kept no particulars of the pupa.

He noted the cocoons were from a quarter of an inch deep to the full depth of the cages, placed usually horizontally, and consisted of fibre spun together with silk, and made smooth inside by being sparingly lined with tough silk. Although of rather a flimsy nature they were nevertheless tougher than, and more compact than, one would have expected, and retained their shape till pulled to pieces. The outside measurements were 20-23mm. long, by 10-12mm. broad.

Bankes has given no details of emergence. I may come across this presently in his note books, but I think that if the larvae had not bred true to type he would have noted the fact. His bred series of *favicolor* in his collection could not be labelled *pallens*, typica, either in whole or part.

It is now a desideratum that someone should breed *Leucania pallens*, typica, from the egg.

Owen Wilson, *The larvae of the British Lepidoptera*, p. 217 (1880), described the larva of *pallens* as follows: "Greyish ochreous: dorsal line white bordered with smoke colour," (not black as in *favicolor*) "intersecting a series of oval brown marks, one on each segment"; (this be it noted is not consonant with Bankes's description of *favicolor*) "subdorsal line white bordered above with grey and below with brown" (this again is not at all like *favicolor*) "between the subdorsal line and the spiracles is a narrow ochreous line bordered above with brown; and below this a grey line; spiracles black ordinary dots black and minute, subspiracular line pale ochreous; head brownish grey and mottled, June, September to May."

It is to be noted that Bankes's larvae of *favicolor* did not hibernate. Buckler's description in the *E.M.M.*, Vol. III., p. 68 (1866), quoted in Newman's *British Moths*, p. 267, No. 451 (1859), is practically similar.

Buckler's *Larvae of Brit. Butterflies and Moths*, Vol. IV., Part 1, p. 31, pl. LX. fig. 1, quotes his description from the *E.M.M.*, and he states that his larvae hibernated. He failed to rear them on *Dactylis glomerata* L. or *Triticum repens* L. but was successful on *Aira caespitosa* L.

Neither author mentions the silver spots which I hardly think Buckler would have overlooked. Nor is any mention made of the red mouth parts, or coral red line. In Fig. 1, however, is shown a red line, but not in the right place to comply with Bankes's description. In fact, an attempt to read Buckler's figure against Bankes's description gives just about the amount of generic agreement one would expect, but not the specific agreement necessary to affirm that one is looking at a picture of the larva Bankes described.

I sincerely hope one of our workers will take in hand the breeding of *Leucania pallens* next season.

ADDITIONS AND CORRECTIONS TO THE LISTS OF LEPIDOPTERA OF HAMPSHIRE AND THE ISLE OF WIGHT.

By William Fassnidge, M.A., F.E.S.

Since the County Lists of Macrolepidoptera and of Microlepidoptera down to the end of the Tortrices were compiled many additional records have come to hand. It is unfortunately not possible to print them all in full, and only the most interesting and important are here collected. Besides the records received from individual entomologists, a large number of new records will be found in the Proceedings of the Isle of Wight Natural History and Archæological Society for 1928, of which again only the most interesting are reproduced. After each record is placed the observer's name the first time it occurs and after that his initials. The order and nomenclature are those of the Lists. The only contractions used are those given in the " List of the Tortrices of Hampshire and the Isle of Wight," published in Volume V., 1929, of the Society's Transactions.

Colias hyale Linn. Bitterne, two specimens in 1929, F. J. Killington ; I.W., several in 1928, I.W.N.H.S., 1928.

C. croceus Fourc. This species was plentiful in 1928 all over the county together with var *helice* Hübn.

Apatura iris Linn. Larvae taken and imagines bred in 1928 in woods near Portsmouth, A. T. Postans ; Cranbury Wood near Winchester, one specimen by Peter Fradgley, 1930, G. L. Thynne ; several seen near South Baddesley, Lymington, Rev. R. Ll. Hodgson.

Polygonia c-album Linn. The eastward migration of this species through all parts of Hampshire and the Isle of Wight, and its increase in numbers until in 1929 it was everywhere common in the county is the entomological event of recent years. Detailed records will be found in the Transactions of this Society for 1929, by Alan Druitt.

Pyrameis virginiensis Drury. I.W., one specimen in 1905 by Prof. E. G. R. Waters ; see *Ent. Mo. Mag.*, 1908, p. 91.

Melitaea athalia Rott. Some 250 imagines were put down by S. G. Castle-Russell at Bourley in 1925, but no colony appears to have resulted.

Strymon w-album Knoch. Alton, regularly but sparingly, E. A. C. Stowell; Farley Mount, locally f.c., W. Fassnidge.

Cupido minimus Fuess. Barton on Sea, a strong colony on the undercliff, W.F., S. A. Jones; Alton, E.A.C.S.; Southbourne cliffs, R. P. Demuth.

Thymelicus lineola Ochs. N.F., in some plenty both in 1927 and 1928. *Ent.*, 1929, p. 137.

Hyloicus pinastri Linn. This species is undoubtedly spreading; it is recorded from just over the eastern boundary by A.T.P., and also close to the western boundary by W. Parkinson Curtis. It will certainly be found in Hants when properly looked for. Vide *Entom.* 1930, pp. 1-6.

Cerura biscuspis Bkh. Aldershot, two larvae, A. W. Richards. It is most unfortunate that this species does not appear to have been bred so far from Hants larvae.

C. bifida Hübn. New Milton, J. R. Freeman; Southbourne, R.P.D.; Aldershot, A. Russell, A.W.R.

Drymonia trimacula Esp. Leigh Park, larvae f.c. in 1926, A.T.P.; N.F., larvae often f.c., R.P.D.; Farley Mount, one specimen at light, W.F.

Pheosia dicteoides Esp. Headley Park, E.A.C.S.; Aldershot, A.R., A.W.R.; I.W., Alverstone, one larva, 1929, E.A.C.S.

Notodonta trepida Esp. Southampton, Great Cover, r., W.F.; Aldershot, A.W.R.; I.W., Alverston, one specimen and several larvae, 1930, E.A.C.S.

Leucodonta bicoloria Schiff. The late Dr. May's collection is now in the Museum of the Mosquito Control Institute, Hayling Island, and by the kindness of Mr. J. F. Marshall I have seen the two specimens of *L. bicoloria* recorded. Dr. May appears to have frequently reared British insects from foreign ova, and these are distinguished by a small square of coloured paper. I think the species was recorded in error and is to be deleted from the List.

Odontesia carmelita Esp. N.F., Wood Fidley, a few larvae in 1923, W.F.; Lyndhurst, two larvae in 1923, G. T. Margerison; Southampton, Great Cover, one specimen, 1930, W.F.

Ptilophora plumigera Esp. Farley Down, two larvae, H. Ashby.

Pygaera curtula Linn. Baddesley, Great Cover, f.c., W.F.; Aldershot, not common, A.W.R., A.R.

P. pigra Hufn. New Milton, c., J.R.F.; Aldershot, c., A.W.R.; Hook, c., A.R.

Palimpsestis octogesima Hübn. Hayling Island, *Ent. Rec.*, 1928, p. 7; Hengistbury Head, one specimen, R.P.D.; Alton, two specimens, E.A.C.S.

P. fluctosa Hübn. Leigh Park, three specimens, A.T.P.

Asphalia diluta Fabr. Hengistbury Head, c., R.P.D.

Polyploca ridens Fabr. Baddesley, Great Cover, larvae f.r., W.F.; I.W., Alverstone, larvae f.c., E.A.C.S.

Dasychira fascelina Linn. Bournemouth, at light, both ♂♂ and ♀♀, as many as six on a lamp, R.P.D.; Aldershot, f.c., A.R.

Drepana lacertinaria Linn. I.W., Alverstone, a few, E.A.C.S.

Earias chlorana Linn. Hayling Island, locally f.c., A. H. Sperring.

Sarrothripa revayana Scop. Highcliffe, S.A.J.; Hayling Island, *Ent. Rec.*, 1928, p. 7; I.W., Parkhurst Forest, I.W.N.H.S.; Alverstone, several, E.A.C.S.

Spilosoma urticae Esp. Emer Bog, one specimen, 1927, W.F.

Coscinia cribrum Linn. This species still flourishes in its old haunts in the west of the county and in Dorset, and comes occasionally to light at Bournemouth and Mudeford.

Nudaria mundana Linn. Alton, E.A.C.S.

Comacla senex Hübn. Hengistbury Head, v.c., R.P.D.; I.W., Alverstone, E.A.C.S.

Endrosa irrorella Linn. Hurst Castle, c., W.F.

Diphtera orion Esp. N.F., Wilverley, R.P.D.; Horndean, larvae c. in 1926, A.T.P.

Acronicta leporina Linn. Aldershot, f.c., A.R.; Bournemouth, R.P.D.; New Milton, J.R.F.; Hengistbury Head, f.c., R.P.D.; I.W., Alverstone, several, E.A.C.S.

Apetela aceris Linn. Aldershot, r., A.R.; Swaythling, W.F.

Jocheaera alni Linn. Fordingbridge, one larva, A. Steven Corbett; Great Cover, one larva, W.F.

Triaena tridens Schiff. and **T. psi** Linn. Careful notes of larvae beaten seem to suggest that *T. psi* is much more common than *T. tridens*, which most members find rare. E.A.C.S. in twenty years has seen from one to two hundred larvae of *T. psi* and only one of *T. tridens*, while W.F. has beaten rather more *T. tridens* than *T. psi*.

Bryophila muralis Forst. Portsmouth, f.c. on the dockyard walls, A.T.P.; Hayling Island, *Ent. Rec.*, 1928, p. 7.

Agrotis vestigialis Rott. Bournemouth, Hengistbury Head, R.P.D.

A. cinerea Hübn. Alton, three specimens, E.A.C.S.; Farley Mount, ♂♂ c. at light, 1929, H.A., W.F.

A cursoria Hufn. Recorded from Hayling Island by A. E. Burras and A.T.P., but I have not seen a Hamsphire specimen which I could be certain was this species.

A. praecox Linn. Southbourne, Hengistbury Head, nine specimens and one larva in 1929, R.P.D.

A. agathina Dup. Hengistbury Head, f.c. in 1927, but only one seen since, R.P.D.

Noctua castanea Esp. var. **neglecta** Hübn. I.W., Parkhurst Forest, S. Wakeley (J. G. Jeffery).

N. baja Fabr. Is this species really generally distributed and more or less common in Hants? Not one of our members seems to take it at all freely nowadays.

N. ditrapezium Borkh. Southbourne, one specimen at light, R.P.D.

N. umbrosa Hübn. Aldershot, c., A.W.R.; I.W., Alverstone, c. in 1930, E.A.C.S.

Triphaena ianthina Esp. Is this species generally distributed and more or less common in Hants? It seems to be very rare nowadays.

Mamestra dissimilis Knoch. Southbourne, Hengistbury Head, c., R.P.D.; Bursledon salt marshes, f.c., H.A., W.F.

M. glauca Hübn. Portsdown, two specimens, A.T.P. I have carefully examined these specimens and am satisfied of their identity.

Tholera cespitis Fabr. Aldershot, A.R., A.W.R.; I.W., Alverstone, one specimen, 1930, E.A.C.S.

Heliophobus hispidus Gey. Common round Poole Harbour in Dorset in 1926, R.P.D. It occurs also fairly commonly at Sandbanks near Parkstone and should certainly be found on the Hampshire coast.

Apamea unanimis Tr. Southampton, Swaythling, f.c., W.F.; Kings Sombourne, W.F.; Aldershot, A.W.R.; I.W., Alverstone, f.c., E.A.C.S.

A. ophiogramma Esp. Nursling, f.c., Kings Sombourne, in Mr. Goffe's garden, W.F.; Alton, E.A.C.S.; Aldershot, A.W.R.; I.W., Alverstone, one specimen, E.A.C.S.

Miana literosa Haw. Aldershot, c., A.W.R.

Aporophyla nigra Haw. Bournemouth, c. in 1928, Southbourne, c. in 1926, R.P.D.; Barton on Sea, S.A.J.; Aldershot, a few, A.W.R.; I.W., Alverstone, f.c., E.A.C.S.

Dasypolia templi Thunb. Just over the border at Parkstone in Dorset, by Mr. Kettlewell (R.P.D.); I.W., Shanklin, 1927, R. H. Fox; Yarmouth, Dr. Young; Atherfield, 1891, Newport, 1912, H.C.J. See I.W.N.H.S. 1928; Alverstone, one specimen at light, 1930, E.A.C.S.

Polia flavicincta Fabr. Aldershot, f.c., A.W.R.

Helotropha leucostigma Hübn. Southbourne, one specimen at light, 1929, R.P.D.

Coenobia rufa Haw. Plentiful in a marsh south of Christchurch, E.G.R.W.; Barton on Sea, very local but common on the undercliff, R.P.D.

Senta maritima Tausch. Hengistbury Head, common in one reedbed, R.P.D.; Portsmouth, locally common, A.T.P.

Tapinostola fulva Hübn. Calshot, G.T.M.; New Milton, S.A.J.; Aldershot, a few, A.W.R.

Calamia phragmitidis Hübn. Hengistbury Head, f.c., R.P.D.; Portsmouth, locally c., A.T.P.

Leucania straminea Tr. New Milton, S.A.J.; Hengistbury Head, R.P.D.

L. obsoleta Hübn. Portsmouth, in an old reedbed, f.c., A.T.P.

L. turca Linn. Horndean, locally f.c. A.H.S.

Caradrina exigua Hübn. 1928 was a great year for this and other immigrant species all along the south coast; twenty-four specimens were taken at Southbourne by R.P.D.

Hydrilla palustris Hübn. In the "*Guide to the Collection of British Lepidoptera in the National Museum of Wales*," 1925, p. 15, there is mention of a specimen from the R. G. Todd collection, labelled Ringwood, Hants, 1870. On the next page we read "a very diminutive ♀ taken flying in daylight, probably the specimen mentioned by Barrett as from the cabinet of P. M. Bright."

Taeniocampa opima Hübn. Southampton, one specimen at sallow, 1924, W.F.

T. populeti Tr. I.W., Wootton, H.G.J., I.W.N.H.S., 1928.

Calymnia pyralina View. Aldershot, f.c. at sugar, A.W.R.

C. diffinis Linn. Southampton, larvae r., W.F.; Aldershot, f.c., A.W.R.

Dyschorista suspecta Hübn. Horndean, f.c., A.H.S., A.T.P.; Hengistbury Head, c. in 1929, R.P.D.

Plastenis subtusa Fabr. Farley Mount, one specimen bred, 1929, W.F.; I.W., Wootton, H.G.J.

Cirrhoedia xerampelina Hübn. Southbourne, one specimen, R.P.D.; Kings Sombourne, larvae f.r., Portsmouth, larvae local, A.H.S.

Cirrhia citrago Linn. Farley Mount, larvae c., W.F.

Mellinia gilvago Esp. Farley Mount, two specimens bred, W.F.

Lithophane semibrunnea Haw. I.W., Alverstone, one specimen, 1930, E.A.C.S.

Cucullia asteris Schiff. Baddesley, Great Cover, larvae v.c., 1925, W.F.

C. chamomillae Schiff. Southampton district, Winchester, Portsmouth, larvae c., 1925, Barton on Sea, f.c., W.F.

Catocala promissa Esp. Horndean, c. and of regular appearance, A.T.P.

Acontia luctuosa Esp. Chilbolton, locally c., H. A., Rev. W. O. W. Edwards; Farley Mount, a few, W.F.

Plusia festucae Linn. Christ church, one specimen, E.G.R.W.; Southbourne, occasionally at light, R.P.D.

Toxocampa pastinum Tr. Eastleigh, locally f.c., W.F.; Bursledon, f.c., W.F., H.A.

Laspeyria flexula Schiff. Farley Mount, r, W.F.; New Milton, S.A.J.; Bournemouth, R.P.D.; Mudeford, occasional specimens at light, A.D.; Chilbolton, in the rectory gardens, W.O.W.E.

Bomolocha fontis Thun. N.F., Cadnam, f.c., Chilworth, f.c. W.F.

Hypenodes costistrigalis Steph. Emer Bog, f.c., W.F.; Farnborough, E.G.R.W.

Tholomiges turfosalis Wocke. Farnborough, c., E.G.R.W.

Brephos notha Hübn. I.W., regularly in the Wootton district, H.G.J.

Hyria muricata Hufn. Farnborough, six specimens, E.G.R.W.

Acidalia inornata Haw. Pamber Forest, E.G.R.W.; Aldershot, A.W.R.; I.W., Alverstone, E.A.C.S.

A. ornata Scop. I can find no record of a capture in Hants or I.W. since the publication of the *Victoria County History*.

A. immutata Linn. Eastleigh, Hengistbury Head, W.F.

A. emutaria Hübn. Hengistbury Head, W.F., c. on the salterns, R.P.D.

Ephyra annulata Schulze. This species is certainly not common everywhere among maple. It appears to be f.c. where maple grows in a wood, as at Fishers Pond, but is v.r. among maple in hedges.

Sterrha sacraria Linn. Mudeford, two specimens, 1928, A.D.

Lobophora polyoommata Hübn. S.E. Hants, larvae f.c., A.T.P.; Farley Down, r., W.F.; Harewood Forest, larvae f.c., H.A., W.O.W.E.

Cheimatobia boreata Hübn. Southampton, W.F. There would be more records for this species if members looked for it among birch and beech, and learned to distinguish it readily from *C. brumata* Linn.

Thera variata Schiff. N.F., throughout on spruce and douglas fir, c., W.F.; Bourley, A.W.R.

Xanthorhoë tristata Linn. The records given appear to be due to a confusion of identity and I suggest the deletion of the species. I have never seen a Hants specimen.

Euphyia picata Hübn. Aldershot, A.W.R.; I.W., Alverstone, E.A.C.S.; common on St. George's Down, I.W.N.H.S., 1928.

Mesoleuca ocellata Linn. Accidentally omitted from the List; generally distributed, often common.

Perizoma adaequata Borkh. I.W., Meyrick's Revised Handbook.

P. bifasciata Haw. Burlesdon, larvae f.c. on *Bartsia odontites*, H.A.

Anticlea berberata Schiff. I have worked for this species among *Berberis* at Farley Mount, but without success, and know of no recent capture.

Euchoeca obliterata Hufn. I.W., Alverstone, f.c., E.A.C.S.

Asthena testaceata Don. Waggoners Wells, formerly c., last record 1910, E.G.R.W.

Eupithecia valerianata Hübn. Southampton, larvae r., W.F; I.W., Alverstone, larvae f.c., E.A.C.S.

E. plumbeolata Haw. Pamber Forest, E.G.R.W.; I.W., Mersley Down, not uncommonly, H.G.J.

E. tenuiata Hübn. Baddesley Common, f.c., W.F.; Aldershot, not c., A.R.

E. fraxinata Crewe. The specimens on which my record of this species at Winchester was based are certainly not *E. fraxinata*, W.F.

Eucymatoge togata Hübn. Aldershot, one specimen, A.W.R.

Collix sparsata Hübn. Shawford, r., W.F.; Aldershot, A.W.R.

Pelurga comitata Linn. Mudeford, f.c. in my garden, A.D.

Percnoptilota fluviata Hübn. Alton, E.A.C.S.; Kings Sombourne, one specimen, E. R. Goffe; Hayling Island, *Ent. Rec.*, 1928, p. 9.

Abraxas sylvata Scop. Portsmouth, A.H.S.; I have looked for this species among wych elm at Farley Mount, from which locality there are old records, but without success, W.F.

Epione advenaria Hübn. Parkhurst Forest, H.G.J.

Hybernia aurantiaria Esp. I.W., Alverstone, c., E.A.C.S.

Phigalia pedaria Fabr. A record of two specimens, 6-8. VII. 1925, at Hayling Island (*Ent. Rec.*, 1928, p. 9,) seems to point to an occasional partial second brood.

Lycia hirtaria Clerck. Southampton, r., W.F.; N.F., a few, J.R.F.

Boarmia abietaria Hübn. Farley Mount, H.A., W.F.

Cleora jubata Thunb. Bournemouth, Southbourne, R.P.D.

Selidosema plumaria Hübn. Aldershot, f.c., A.R., A.W.R.

Aspilates gilvaria Fabr. I.W., broken cliffs east of Sandown, H.G.J.

Cochlidion limacodes Hufn. Odiham, W.F.; I.W., Alverstone, one specimen, E.A.C.S.

Zeuzera pyrina Linn. N.F., Lyndhurst, one specimen, E.S.C.; Wootton, a ♀ on an ash trunk, A. Ford; Farnborough, A.W.R.; Bournemouth, R.P.D.

Trochilium crabroniformis Lew. New Milton, J.R.F.; Alice Holt, A.W.R.

Aegeria flaviventris Stgr. Discovered as British in 1926 from Southampton. A list of localities will be found in *Trans. Ent. Soc. Hants*, 1928. I.W., several localities, H.G.J.

Ae. vespiformis Linn. I.W., Parkhurst Forest, a few, I.W.N.H.S.; Alverstone, several bred, E.A.C.S.

Ae. myopiformis Borkh. Southampton, a few in a town garden, G.T.M.

Ae. formiciformis Esp. Baddesley Common, in old sallows, Shawford, New Milton, f.c., W.F.; Hengistbury Head, f.c., S.A.J.; Hordle, Barton on Sea, J.R.F.

Ae. ichneumoniformis Fabr. Farley Mount, f.c., W.F.; Barton on Sea, one specimen swept by Dr. Blood; I.W., locally c. on the coast, E.A.C.S.

Pyralidina.

Cledeobia angustalis Schiff. Baddesley, Hurst Castle, Farley Mount, f.c., W.F.; Christchurch, A.D., Hayling Island, *Ent. Rec.*, 1928, p. 10; I.W., Alverstone, f.c., E.A.C.S.

Aglossa cuprealis Hübn. I.W., Alverstone, E.A.C.S.

Pyralis glaucinalis, Linn. N.F., Brockenhurst, H. C. Huggins; Christchurch, A.D.; I.W., Alverstone, a fair number, E.A.C.S.

P. farinalis Linn. N.F. Brockenhurst, Beaulieu Road, H.C.H.; Christchurch, A.D.; Barton on Sea, S.A.J.

Scoparia cembrae Haw. N.F., Beaulieu Road, H.C.H.; Barton on Sea, f.c., W.F., S.A.J.; Farley Mount, a pale form, W.F., H.C.H.

Witlesia pallida Steph. Baddesley Common, f.c., W.F.; Christchurch, A.D., E.G.R.W; Hurst Castle, W.F.; I.W., Freshwater, E.G.R.W., H.C.H.

Eudoria resinea Haw. N.F., one specimen, W.F.

E. angustea Steph. Bournemouth, E.G.R.W.; New Milton, S.A.J.; I.W., Headon Hill, Ventnor, E.G.R.W.; Freshwater, H.C.H.

Ennychia cingulata Linn. Farley Mount, f.c., W.F.

E. nigrata Scop. Broughton Downs, c., W.F.; New Milton, not c., S.A.J.; I.W., Freshwater, H.C.H.

Botys hyalinalis Hübn. Farley Mount, c. at light, W.F.

B. fuscalis Schiff. N.F., near Wood Fidley, H.C.H.; Shawford, c., W.F.; Pamber Forest, among *Melampyrum*, E.G.R.W.

Ebulea verbascalis Schiff. Southampton, near the Common, J. Park; Baddesley, Great Cover, c., W.F.; I.W., Freshwater, H.C.H.

E. stachydalis Zinck. Christchurch, one specimen, A.D.; I.W. Freshwater, H.C.H.

Spilodes palealis Schiff. Christchurch, one specimen, A.D.

Perinephele lancealis Schiff. N.F., Rhododendron Drive, c., S.A.J.; Brockenhurst, H.C.H.; New Milton, S.A.J.; I.W., Alverstone, several, E.A.C.S.; Yarmouth, H.C.H.

Stenia punctalis Schiff. Hurst Castle, f.c. W.F.

Cataclysta lemnata Linn. Swaythling, Odiham canal, c., W.F.

Paraponyx stratiotata Linn. Odiham canal, c., W.F.

Adactylus benneti Curt. Bursledon salt marshes, c., H.A., W.F.; Southampton Water, W.F.

Adkinia zophodactyla Dup. N.F., Linwood, one specimen, W.F.; Portsmouth, A.T.P.; I.W., Yarmouth, H.C.H.

A. graphodactyla Tr. N.F., Ringwood, H.C.H.; Beaulieu Road, J. W. Corder; Southwest Hants, A.D.

Amblyptilia acanthodactyla Hübn. Southampton, f.r., Farley Mount, f.c., W.F.; Portsmouth, A.T.P.; Barton on Sea, f.c., S.A.J.

A. cosmodactyla Hübn. N.F., Brockenhurst, H.C.H.; Mudeford, in my garden and at light, A.D.; I.W., Yarmouth, H.C.H.

Platyptilia gonodactyla Schiff. Swaythling, W.F.; Barton on Sea, c., W.F., S.A.J.; Highcliffe, S.A.J.

P. isodactyla Zell. River Stour near Christchurch, locally common, E.G.R.W.

Oxyptilus heterodactyla Vill. Southampton, Chandlers Ford, f.c., W.F.; Hayling Island, f.c., W.F., A.T.P.

Buckleria paludum Zell. N.F., Beaulieu Road, f.r., W.F.; Matley, Lyndhurst, Rev. C. R. Digby; Woolmer Forest, f.c., Aug. 2nd, 1928, E.G.R.W.

Oedematophorus lithodactyla Tr. N.F., Brockenhurst, C.R.D.; Farley Mount, f.c. among *Inula squarrosa* W.F.; I.W., Ventnor, E.G.R.W.

Leioptilus tephradactyla Hübn Baddesley, Great Cover, f.c., W.F.

L. carphodactyla Hübn. Farley Mount, f.c., W.F.; Portsdown, one specimen, A.T.P. (This is the specimen recorded as *Hellinsia osteodactyla* in the List; the error in indentification was mine, W.F.); I.W., Freshwater, Sandown, H.C.H.

L. microdactyla Hübn. N.F., Brockenhurst, C.R.D.; Shawford, Winchester, c., W.F.; I.W., Freshwater, H.C.H.

Schoenobius forficellus Thunb. Many specimens of the dark unicolorous form mentioned by Barrett were taken in Denny Bog in 1928. Similar specimens taken in 1927 were recorded by me in error as *Chilo phragmitellus* Hübn. in *Trans. Ent. Soc. Hants*, 1928, pp. 22 and 55, W.F.; Swaythling, W.F.; I.W., Freshwater, H.C.H.

S. mucronellus Schiff. Christchurch, A.D.; Alton, E.A.C.S.

Calamatropha paludella Hübn. I.W., taken by L. T. Ford, H.C.H.

Platytes cerussellus Schiff. Hurst Castle, c., W.F.; Gosport, c., A.H.S.

Crambus falsellus Schiff. Christchurch, one specimen, A.D.; I.W., Freshwater, H.C.H.

C. dumetellus Hübn. Farley Mount, c., W.F.; This insect is probably often overlooked. I find it common in several localities.

C. uliginosellus Zell. Woolmer Forest, E.G.R.W.

C. latistrius Haw. Christchurch, A.D.; in and around Bournemouth, E.G.R.W.; Hayling Island, A.H.S.; I.W., Headon Hill, E.G.R.W.; Alverstone, E.A.C.S.

C. salinellus Tutt. Hengistbury Head, one specimen, W.F.

Myelois cirrigerella Zinck. Farley Mount, one specimen, June, 1927, W.F.

M. neophanes Durr. N.F., Beaulieu Road, one specimen among burnt heather (det. H.C.H.), W.F.; I.W., among burnt gorse on downs, H.C.H. See Ent. 1929, p. 20.

Homoeosoma sinuella Fabr. Swaythling, f.c., Barton on Sea, c., Hurst Castle, c., W.F.; I.W., Alverstone, E.A.C.S.

H. nimbella Zell. Romsey, one specimen, W.F.; I.W., Freshwater, E.G.R.W.

H. binaevella Hübn. Christchurch, A.D.; Swaythling, f.c., Bursledon, W.F.; I.W., Freshwater, H.C.H.

H. nebulella Hübn. I.W., Yarmouth, H.C.H.

Ephestia kuehniella Zell. Woodmill, Nursling Mill, in myriads, W.F. Probably in every flour mill in the county. I.W., Shanklin, c. in bakehouses, I.W.N.H.S., 1921.

E. ficulella Barr. Southampton, a few bred (det. H.C.H.), W.F.

E. elutella Hübn. N.F., Brockenhurst, H.C.H.; Southampton, beaten in numbers from a rick, and taken sparingly in the house, W.F.; Portsmouth, indoors, A.T.P.; Barton on Sea, S.A.J.

Euzophera pinguis Haw. Swaythling, larvae f.c., W.F.; I.W., Freshwater, E.G.R.W.; St. Lawrence, one specimen, Major Scott.

Cryptoblabes bistriga Haw. N.F., Brockenhurst, Beaulieu Road, H.C.H.; New Milton, f.c., S.A.J.; I.W., Yarmouth, H.C.H.

Phycis betulae Göze. N.F., Brockenhurst, H.C.H.; Farley Mount, W.F.; I.W., Alverstone, E.A.C.S.

P. fusca Haw. Waggoners Wells, E.G.R.W.; New Milton, S.A.J.; I.W., Yarmouth, H.C.H.

Dioryctria abietella Fabr. N.F., Matley, c. in 1930, beaten from scots pine burnt the previous year, W.F., H.C.H; Waggoners Wells, E.G.R.W.; Barton on Sea, S.A.J.

Nephopteryx spissicella Fabr. Pamber Forest, E.G.R.W.; I.W., Alverstone, E.A.C.S.

N. genistella Dup. Portsmouth, f.c., A.H.S.; New Milton, at light, J.R.F.; I.W., Yarmouth, larvae f.c., W.F.; Freshwater, H.C.H.

N. similella Zinck. N.F., four specimens, June, 1928, A. R. Hayward in *Ent.*, 1928, p. 282.

Pempelia palumbella Fabr. Woolmer Forest, Farnborough, E.G.R.W.; I.W., Yarmouth, A.C.H.

Rhodophaea formosa Haw. Swathling, two specimens beaten and larvae later not c., W.F.; I.W., Yarmouth, one larva (bred) and a number of empty webs on elm, September, 1928, E.G.R.W.

R. advenella Zinck. N.F., Denny, larvae f.c., W.F.; Southampton, Farley Mount, larvae f.c., W.F.

R. marmorea Haw. N.F., Denny, not c., Southampton, r., W.F.; I.W., Yarmouth, not c., W.F.

R. suavella Zinck. N.F., Brockenhurst, H.C.H.; Denny, v.c., W.F.; Christchurch, A.D.; I.W., Yarmouth, c., W.F.

R. tumidella Zinck. N.F., Brockenhurst, H.C.H.; I.W., Alverstone, E.A.C.S.

Hypochalcia ahenella Hübn. Farley Mount, W.F.; I.W., Freshwater, H.C.H.

Galleria mellonella Linn. Christchurch, A.D.

Aphomia sociella Linn. Farley Mount, c., W.F.; Barton on Sea, S.A.J.

Achroea grisella Fabr. N.F., Brockenhurst, H.C.H.; Sholing, f.c., W.F.; New Milton, at light, J.R.F.

Tortricina.

Cacoecia pronubana Hübn. New Milton, one specimen at light, J.R.F.

Peronea boscana Fabr. Swaythling, a good series, W.F., H.C.H.

Eucosma rubiginosana Herr.-Schäff. Southampton, Lordswood, f.r., W.F.

E. quadrana Hübn. Great Cover, v.c. in 1930, larvae abundant later, W.F.

E. rufimitrana Hübn. Farley Mount, W.F.

E. vacciniana Zell. N.F., Matley, c., Chilworth, v.c., W.F.

E. fractifasciana Haw. Farley Down, Broughton Down, f.c., W.F.

Endothenia ericetana Westw. Bursledon, f.r., W.F.

Hemimene alpestrana Herr-Schäff. Baddesley, Emer Bog, Castle Lane, c., W.F.

Laspeyresia cosmophorana Tr. N.F., Beaulieu Road, Matley, f.c., W.F.

L. conicolana Heyl. N.F., a series taken flying round young trees of *Pinus sylvestris* in June, 1930, W.F. See *Ent.* 1931, p. 27.